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DECORTICATION OF THE LUNG

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SHREVEPORT

INTRODUCTION

Pulmonary decortication consists of the removal of an organizing or organized fibrous membrane from the visceral pleura. Its purpose is to allow immediate expansion of an unexpandable or slowly expandable lung by removing the constricting membrane or peel. This allows the lung to expand and fill the pleural cavity. It is thus the opposite of thoracoplasty which allows the chest wall to fall in and approximate the lung. It is a physiologically sound operation as it allows normal lung to fill the pleural cavity, obliterating dead space, and avoiding the lowering of pulmonary function and deformities of thoracoplasty.

Fowler[1] in 1893 first performed this operation. Delorme[1] reported on the procedure in 1894, and in 1896 gave it its present name. In succeeding years modifications have been frequent. Ransohoff[1] introduced discission, and numerous individuals combined partial decortication with collapsing operations of the Schede or Estlander types. Lilienthal[1] in 1915 reported on an extensive series of acute and chronic empyema treated by decortication.

All of these operations differed in at least two important respects as compared to the operations done today. Decortication was usually partial, no effort being made to free the lung completely up to the hilum and pulmonary ligament. This is easily understandable as an effort to prevent opening up fresh areas for the spread of infection. Possibly the availability of modern chemotherapeutic and antibiotic agents has made us bolder in this respect, but it has been proved that total pulmonary decortication in the presence of pleural infection may be successfully carried out without use of these agents. It will be pointed out later that complete freeing of the lung and its fissures is one of the most important details necessary to assure a satisfactory result. The second difference is that until recently the operation ended up with open drainage or packing of the pleural cavity with consequent slow expansion of the lung and subsequent chest wall deformity, residual empyema, and incomplete expansion. Numerous operative procedures were necessary in the majority of cases before the pleural space could be obliterated. We now realize that rapid expansion of the lung with adherence to the chest wall and obliteration of the pleural cavity is the goal to be sought.

The generally unsatisfactory results, the numerous operative procedures necessary and the high operative mortality gradually caused decortication to fall into disuse. Its revival may be attributed to advances in surgery, particularly thoracic surgery, improved anesthesia, improved preoperative and postoperative care, availability of effective chemo and antibiotic therapy, and the stimulus of numerous thoracic casualties during the late war.

In May 1943, Burford[2] performed the first modern type decortication on a patient

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with clotted hemothorax. Samson and Burford[1] estimated in 1946 that at least 1,500 early decortications had been done with a mortality of less than 2 per cent. Since this time a large number of reports have been added to the literature.

PATHOLOGY

An understanding of the pathology of the membrane or "peel" which encases the collapsed lung is essential for there is a true pathologic basis for the employment of decortication in indicated cases. Unfortunately the term "thickened pleura" has been handed down for years to describe this condition although many of the older writers recognized correctly the pathology present.

Any substance which occupies the pleural cavity and causes collapse of the lung may initiate the formation of an organized membrane on the pleural surfaces. We have seen this occur due to the presence within the pleural cavity of blood, pus, bile, and even air present over a long period of time. The deposition of fibrin on the pleural surface, the initial phase of formation of the "peel", may thus be due to settling of fibrin out of blood or pus or, we think, to the irritative effect of the intrapleural substance on the pleura causing an exudative pleuritis. If the lung is not allowed to expand this fibrinous pleuritis would then organize and form the "peel" holding the lung in a collapsed condition. In no other way can the occurrence of this condition in bile pleuritis, chronic pneumothorax, or long standing pleural effusion be explained. The formation of the membrane or "peel" certainly appears to be an inflammatory reaction although the amount of inflammation varies considerably in various conditions. Certainly, some of the thickest membranes we have found have been in cases of bile pleuritis, often coming on late, and due to the continuous leakage of bile into the pleural cavity. The continuous accumulation of bile prevents expansion of the lung and the irritative effect of bile on the pleura causes an exudative pleuritis which undergoes organization. It may well be that nonexpansion of a lung due to air leakage into the pleural cavity, atelectasis, or lung hematoma is of more importance in the formation of a "clotted hemothorax" than actual blood clotting. This would explain the etiology of those cases coming on after early thoracotomy and evacuation of the pleural cavity. A recent case, not included here, of pneumohemothorax following a gun shot wound substantiates this theory. The blood was easily aspirated, but the pneumothorax continued due to bronchopleural fistula. For a week, or more, the blood was kept removed, then the chest began to fill up, and a typical picture of clotted hemothorax occurred. This was certainly due to exudation into the pleural cavity. It is probable that the only influence of the pleural clot is to prevent aspiration, and thus lung expansion, and to cause increased exudation over absorption. Animal experiments using defibrinated blood, bile and other irritants in the pleural cavity would probably settle the pathogenesis of the above condition. Langston and Tuttle[3] have recently advanced this hypothesis for the explanation of chronic traumatic hemothorax.

Grossly the intrapleural mass consists of a membrane covering both visceral and parietal pleura and continuous from one to the other. Its thickness varies considerably depending upon age and etiology. It is usually thinnest in uncomplicated clotted hemothorax and thickest in chronic empyema. It is thickest in areas where the visceral and parietal elements merge. It usually extends into adjacent fissures and into the costophrenic gutters causing fixation and elevation of the diaphragm. The unoccupied pleural cavity is usually obliterated by flimsy adhesions. The peel itself is a membrane consisting of organizing fibrous tissue of varying density in different cases, closely adherent to the pleura from which it may be stripped. Towards the cavity the peel becomes less and less organized and its inner aspect is covered with fibrin. The center of the mass consists of fluid and fibrin and is often loculated. The color of the peel and the contents of the cavity vary considerably depending upon the etiology. The greatest mass occurs posteriorly as the

result of the position of the patient in bed. When the cavity is entered and all fluid and fibrin evacuated one sees a smooth walled cavity which obliterates all underlying landmarks.

Microscopically the appearance of the "peel" varies considerably with its age and the agent producing it. It appears to be essentially the progressive organization of a layer of fibrin or fibrinous exudate covering the pleural surfaces. The organization begins next to the pleural surface, and therefore, is more mature in this area. Towards the center of the cavity the organization becomes progressively less, and the inner layer consists of fibrinous exudate containing varying amounts of leucocytes depending on whether or not infection is present. In fairly recent cases capillaries are seen in the layer closest to the pleura while in old cases fair sized arteries and veins may be noted. In old cases dense fibrous septa may be seen extending into the underlying lung. Organization seems to be a continuous process probably stopping only when the denseness of the membrane prevents further exudation into the cavity or when the entire mass is organized.

It is to be emphasized that the organization occurs on the surface of the pleura. Samson and Burford[1] state that elastic fibers are never found in the peel but are regularly found in sections taken so as to contain pleura.

THE OPERATION

Preoperative care is essentially the same as for any major surgical procedure and will not be given in detail here. Penicillin is administered preoperatively if there is any suspicion of infection, and sufficient blood is made available—usually 1,000 to 2,000 cc. Preliminary drainage of the pleural cavity may be necessary in very ill patients, and preoperative postural drainage or bronchoscopy, or both are used in patients with bronchopleural fistula.

Intratracheal positive pressure ether-oxygen or cyclopropane has been used in all cases. Controlled respiration has been used in some of the cases and gives a quiet field in which to work.

The patient is placed on his side with the operative site upwards and a canula is placed in an ankle vein before the incision is made. Blood is given continuously during the procedure.

A posteriolateral incision is made and the cavity is entered through the bed of the resected seventh rib. A rib above and below this site may be chosen occasionally, depending on where the major difficulty is anticipated. We feel that rib resection gives a little more room and provides a better closure.

After opening into the cavity, fluid and clots are evacuated and loculations broken up. It is important to free the costal part of the peel for some distance above and below the incision before the ribs are spread, otherwise the lung may be torn severely. This is done in the extrapleural space, no effort being made to spare the parietal pleura. After the rib spreader is inserted the cavity is further cleansed of all debris, and a smooth walled cavity obliterating all underlying landmarks is seen. A transverse incision is carefully made with the knife through the peel overlying the lower lobe. This is carefully deepened until underlying lung covered with pleura herniates through. The cut edges of the peel are then grasped with forceps and it is dissected off the lung mainly by blunt dissection with the fingers and small gauze dissectors. It is occasionally necessary to use sharp dissection, especially at the fissures, at the reflection of the peel onto the chest wall, and on the diaphragm. It is important to try to remove it intact or at least in large pieces as it is easier to keep in the cleavage plane in this way. If the visceral pleura or lung is torn, this area is abandoned temporarily and dissection restarted in another area. While minor lung tears are almost impossible to prevent in old cases, especially in empyema, they should be kept to a minimum as the air leakage thus caused may prevent rapid lung expansion.

The peel is carefully removed from the lung and all involved fissures are carefully dissected free. Beyond the reflection of the peel onto the chest wall the pleural cavity is usually obliterated by flimsy adhesions,

and dissection may proceed rapidly. It is important to completely free the lung from the chest wall, mediastinum, and diaphragm up to the hilum and pulmonary ligament so that expansion will be rapid and normal relations restored.

At this point the lung is carefully inspected and any other procedure such as suture, wedge resection, or segmental lobectomy carried out.

It is important that several times during the procedure after the lung is freed, it be slowly expanded under positive pressure and atelectatic areas gently massaged.

Attention is then turned to the chest wall. While most authors have advocated not decorticating the chest wall, we have felt that it adds little to the operation and removes a source of scar tissue that might cause chest wall deformity and fixation. The costal peel is removed along with the parietal pleura, dissection being carried out in the extrapleural plane. This is rapidly and easily done and causes remarkably little bleeding. The diaphragm is then decorticated and its sinuses freed up as well as is possible.

The pleural cavity is irrigated with saline and air leaks sought. Large ones, if present are sutured, small ones disregarded.

Two large soft rubber tubes or catheters with multiple perforations are placed into the pleural cavity through stab wounds, one in the eighth or ninth interspace in the posterior axillary line and another in the second or third interspace in the midclavicular line. These are connected through a "Y" tube to an underwater seal. The lung is expanded and the chest wall closed in layers with interrupted cotton sutures.

We have given penicillin intrapleurally in some cases, but not in all, and do not think it very useful as we use drainage immediately after operation, believing that rapid lung expansion is the most important element in preventing infection. Besides, the constant ooze of blood and serum should contain a bacteriostatic concentration of penicillin.

Postoperatively it is most important that the drainage tubes be properly cared for. These are milked at regular intervals. We have not used suction, finding that the negative pressure obtained by the use of an underwater seal is sufficient. The tubes are removed as soon as they cease draining, usually between twenty-four to forty-eight hours. After they cease draining they serve no useful function and act as an intrapleural foreign body. We have not irrigated the drainage tubes. Penicillin is continued postoperatively.

The patient is mobilized early, usually being out of bed the first postoperative day. He is urged to cough, and perform breathing and arm exercises. He should receive sedatives enough to allay pain, but not enough to suppress the cough reflex. Manual support during coughing is helpful and if pain is severe intercostal block may be done.

Lung expansion is followed closely. If breath sounds come through clearly and the tubes have stopped draining one can be fairly certain that expansion is adequate. The patient is sent to the x-ray department for desired roentgenograms, as portable films are not very satisfactory. A regular diet is allowed as soon as nausea subsides. Sutures are usually removed on the fifth or sixth day.

Complications have been infrequent. Atelectasis has been treated by voluntary coughing or tracheal aspiration, although if severe and unrelieved, bronchoscopy would be indicated. Occasionally a postoperative thoracentesis is indicated, and we have done rib resections for drainage of a small residual pocket resulting from the subdiaphragmatic drain accidentally having come out after a decortication for bile empyema. One patient who had a decortication and segmental lobectomy for amebic pleuritis with bronchopleural fistula did not expand completely and still has a fluid filled pocket in his pleural cavity, although his bronchopleural fistula remained closed. He will probably need redecortication.

There have been no wound infections.

INDICATIONS FOR DECORTICATION

Langston[4] has pointed out that, given an intact chest wall, there are three factors

that prevent pulmonary expansion. These are:

1. Bronchial, as in atelectasis.
2. Pulmonary, as in massive fibrosis.
3. Pleural
   a) Presence within the pleural cavity of air, pus, bile, blood, etc.
   b) Constricting pleural investments or membranes.

While all the above factors are of importance in differential diagnosis and may be important in etiology, it is only in nonexpansion due to constricting pleural investments or membranes that decortication is indicated.

The following conditions may, because of inadequate, or even in spite of early adequate treatment, give rise to an unexpanded lung because of constricting membranes and thus become candidates for decortication:

1. Organizing or organized hemothorax
   a) Uninfected
   b) Infected
2. Empyema
   a) Pyogenic
   b) Bile
   c) Tuberculous
   d) Miscellaneous
3. Chronic pneumothorax
4. Organized pleural effusions

Contraindications to decortication in the above conditions would be unrelieved bronchial obstruction, massive pulmonary fibrosis, and fear of exacerbating an underlying lung infection by re-expansion.

ORGANIZING OR ORGANIZED HEMOTHORAX

More decortications have been done for this condition than for all others combined and, as has been pointed out, this served as a major stimulus for revival of the procedure. Large series of cases have been reported by Burford, Parker, and Sampson,[3] Tuttle, Langston and Crowley,[2] and others.

Patients with organizing hemothorax are observed and repeated aspirations attempted for a period of three weeks. If, at the end of this time progressive resolution is not taking place, and it is felt from clinical and x-ray studies that impairment of pulmonary function and chest wall deformity will occur, decortication is carried out.

Sampson and Burford[1] carry out decortication at the end of four to six weeks if the patient presents all or part of the following criteria.

1. Roentgenographic evidence of a generally hazy chest.
2. Lateral pulmonary compression of 50 per cent or more with a collapsed apex.
3. Poor thoracic expansion with retraction and narrowing of interspaces.
4. Diffuse thoracic pain or discomfort.
5. Dyspnea on exertion.

The period of observation and repeated aspiration is carried out because many will clear sufficiently in this time and also because the peel is technically easier to remove after a lapse of time as it becomes tougher and strips more readily.

If infection of the hemothorax occurs decortication is carried out earlier as the peel organizes rapidly. Infection does not basically alter treatment and one may be surprised at times to find pus present in clinically uninfected cases.

The following case is presented as a typical result following decortication for organizing hemothorax.

B. F., colored male, was admitted December 1, 1946, with a diagnosis of clotted hemothorax. He had suffered a gun shot wound of his right chest with fracture of his fifth rib on November 23. Decortication was carried out on December 16, and he was discharged on December 22, afebrile and lung expanded. (Fig. I, a & b).

EMPYEMA

Decortication for empyema is somewhat of a new concept as it converts what is usually a partial empyema into a total empyema and then obliterates the pleural cavity by rapid lung expansion. It is not indicated in those cases which will respond readily to less radical measures. It is indicated in those cases in which it is felt, by history, examination and x-ray studies, that full expansion will not occur. It is also indicated in cases in which expansion will be so slow that marked chest wall deformity and fixation will occur. Very ill and toxic patients or those with significant acute lung pathology may be prepared for

Figure 1a. Preoperative

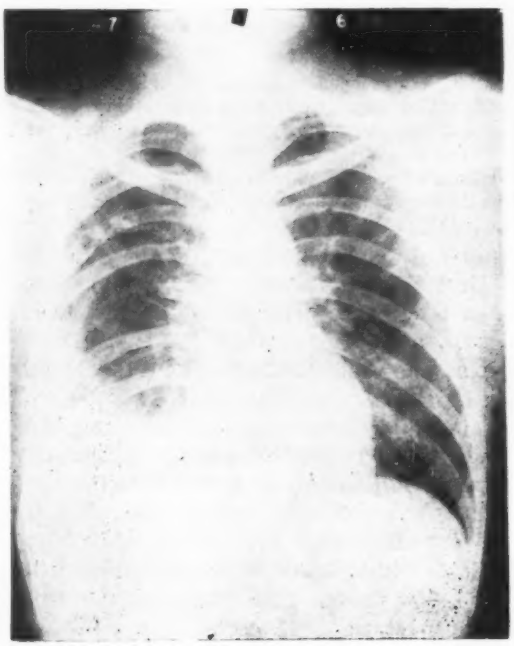

Figure 1b. Postoperative

decortication by open drainage. Aspiration and injection of penicillin may also be of value preoperatively and may even sterilize the cavity. Sanger[6] and Curreri and Gale[7] have recently reported cases of acute and chronic empyema treated by decortication.

R. H., 5 year old white male, was admitted May 5, 1947, with a diagnosis of lobar pneumonia of the right lower lobe. He was started on penicillin on admission. Subsequent examination revealed a massive empyema with collapse of the lung. Numerous aspirations and injections of penicillin sterilized the cavity but the lung showed no tendency to expand. Decortication was carried out on June 19. The lung fully expanded within twenty-four hours. He was discharged July 19, with a fully expanded lung. (Fig. 2 a & b).

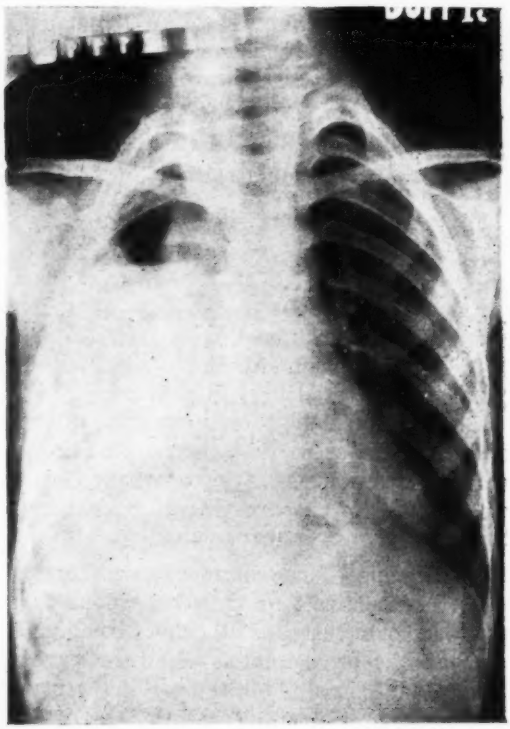

Figure 2a. Preoperative

BILE EMPYEMA

Bile empyemas, while infrequently reported in the literature, were relatively frequent in thoracic centers during the war according to Shaw[8]. Guy and Oleck[9] recently could find only six reported cases of traumatic biliary-bronchial fistula, includ-

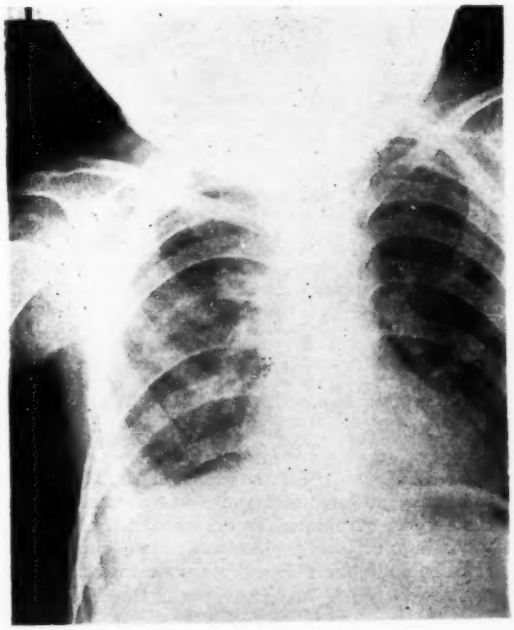

Figure 2b. Postoperative

ing two of their own, but I believe they are much more frequent than reports indicate. Bile empyema presents the same indications for decortication as other conditions causing unexpandable lung because of constricting membranes. The only difference in treatment is that the diaphragmatic opening must be closed and provision made for prolonged subdiaphragmatic drainage of bile.

M. G., 35 year old colored male, was admitted March 16, 1946, with a recent gun shot wound of the lower right chest. Because of abdominal rigidity exploratory laparotomy was performed, with negative findings. Postoperatively he showed signs of fluid in his right chest and multiple aspirations were carried out. These did not succeed in emptying the pleural cavity and x-ray showed massive collapse of the right lung with loculated fluid in the pleural cavity. Decortication was done on April 4, the opening in the diaphragm closed, and subdiaphragmatic drainage established through the costophrenic sinus. Postoperatively the lung expanded immediately but a small residual pocket of bile occurred following the accidental coming out of the subdiaphragamtic drain. This was treated by resection of a segment of the tenth rib with open drainage on April 18, and on June 25 he was discharged afebrile and with a fully expanded lung and a healed chest wall. (Fig. 3 a & b).

Figure 3a. Preoperative

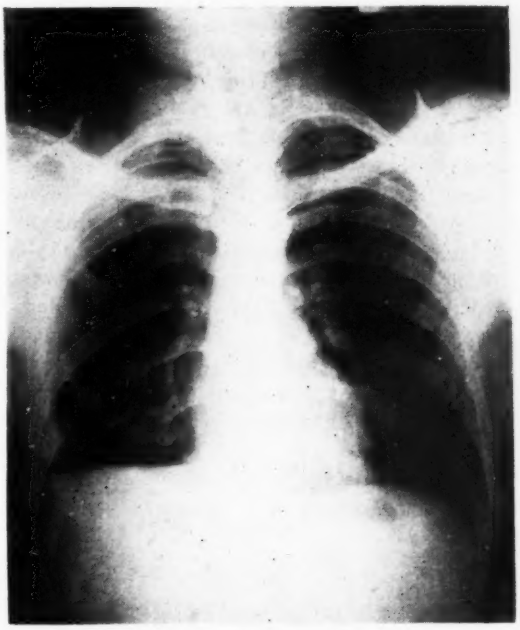

Figure 3b. Postoperative

TUBERCULOUS EMPYEMA

Tuberculous empyema offers the greatest challenge to decortication. Sporadic cases have been reported and recently Gurd[10] and Lam[11] have each reported several cases. It is likely that it will be very useful in cases without underlying lung pathology and, combined with thoracoplasty in cases in which the tuberculous pulmonary lesion is limited to the upper lobe. This would prevent reactivation of the lesion, obliterate the empyema cavity, and preserve the function of the lower lobe. I have no personal experience with decortication in tuberculous empyema.

ORGANIZED PLEURAL EFFUSIONS AND CHRONIC PNEUMOTHORAX

I have not performed decortication for either of these conditions. Paulson[12] states that he has carried out the procedure in several cases of organized pleural effusion and a recent case of chronic pneumothorax seen at autopsy demonstrated the feasibility of decortication for this condition. The indications would seem to be clear and the treatment identical to that of constricting membranes caused by other agents.

SUMMARY

Pulmonary decortication is indicated in a variety of conditions which cause an unexpandable lung because of constricting pleural investments.

It is a physiologically sound operation which obliterates pleural dead space, preserves lung function and minimizes chest wall fixation and deformity.

An hypothesis is presented which explains the pathogenesis of unexpandable lung because of constricting pleural investments caused by a large variety of etiologic agents.

The operative technic and preoperative and postoperative care are discussed and a plea made for decortication of the chest wall.

Indications are discussed and representative cases reported.

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DISCUSSION

Dr. L. H. Strug (New Orleans): Dr. McCook is to be congratulated on his excellent presentation of the subject of pulmonary decortication. His fine work has certainly prevented many individuals from becoming chronic pulmonary cripples. I was most fortunate in being present in the Mediterranean theater during the recent war, when Sampson and Burford made their important contribution. Their initial effort, plus subsequent contributions by many others, was responsible for the popularization of pulmonary decortication in both clotted and infected hemothoraces and the procedure lately has been extended once more to the treatment of acute and chronic empyema.

The procedure of pulmonary decortication is an old one as has been shown by Dr. McCook. It was originally devised for the treatment of chronic empyema. Prior to the recent world war, the procedure was a most difficult one and was attendant with a high morbidity and mortality and thus had largely been abandoned. That this procedure could be successfully performed in the earlier days was ably demonstrated by Lilienthal, who in 1915 reported 23 cases of decortication of the lung for empyema with a mortality of only 17 per cent. This was phenomenal in its day. Hedbloom, in 1920, also reported many successful results. However, by far and large the results were unsuccessful.

Sampson and Burford reasoned that the difference in failure at that time and success now was due to several factors, namely: (1) anesthesia, (2) antibiotics, (3) timing of the decortication, (4) adequate preoperative and postoperative care.

When should a pulmonary decortication be performed? The difficulties encountered when the processes of clotted hemothorax or chronic empyema were allowed to go on for some time were amply demonstrated by numerous clinical investigators. This is due to increasing fibrosis of the exudate covering the visceral pleura which infiltrates into the lung proper as the process ages. This pathologic process was demonstrated by Graham in his

treatise on empyema. Realizing this fact, both Sampson and Burford by trial and error arrived at what they considered an optimal time for pulmonary decortication. The time eventually chosen was between four and seven weeks following the onset of the clotted hemothorax, and somewhat earlier in infected hemothorax.

On the Louisiana State University Surgical Service at Charity Hospital in New Orleans 17 pulmonary decortications were performed during 1946-47. Two additional cases were performed recently but have not been added to this statistical study, which I will briefly mention. Of the 17 cases, 3 were performed for clotted hemothorax and 14 for empyema. The age group in the empyemas varied from 3 months to 46 years. The results upon discharge from the hospital were classified as excellent in 14, good in 2, and poor in 1. A bad result was one in which a subdiaphragmatic abscess ruptured into the pleural cavity, although the opening into the diaphragm was closed at the time of decortication, a point which was emphasized by Dr. McCook. Adequate drainage below the diaphragm was not performed at that time. This necessitated additional surgery later, both in the chest and abdomen.

DISSEMINATED COCCIDIOIDOMYCOSIS

REPORT OF A CASE IN LOUISIANA*

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Since the original report of a case of coccidioidal granuloma in the United States by Rixford and Gilchrist[1] in 1896, a large and voluminous literature has accumulated concerning the varying manifestations of this clinical syndrome. There is general agreement that the etiological factor, the *Coccidioides immitis*, is a native of the arid regions of the western and the southwestern United States and particularly of certain semidesert areas of California. It is natural, therefore, that the vast majority of the cases reported in the United States have originated from these areas. The increasing ease of travel, especially by migratory workers, has resulted in a widening of exposure. In addition, during the recent war large numbers of troops were trained in the desert areas of the West and the Southwest and as a result of these two factors, the disease has become widely distributed throughout the entire country. Sporadic cases may be encountered in any community. The usual manifestation of infection from the clinical viewpoint is that of a relatively mild but somewhat prolonged pulmonary infection with eventual complete recovery. Jamison,[2] however, in a study of an extensive series of cases, found that from 10 to 15 per cent gradually developed chronicity without healing and recovery in the usual periods of time. Approximately 15 per cent of his cases in the chronic group finally evolved into fatal cases of systemic dissemination (probably through the blood stream). Two such cases have already been reported from Louisiana. The first was by McDonald[3] in 1934 and the second by Schenken and Palik[4] in 1942. The third is presented in this paper.

CHARACTERISTICS OF THE ORGANISM

The *Coccidioides immitis*, the etiological agent of coccidioidomycosis appears in the tissues of the infected host as a sporule with a double contoured thick hyaline capsule which varies from 5 to 80 micra in diameter.[2] Early in the development of the sporule only a granular type of cytoplasm can be seen. With increasing age the cytoplasm of each sporule groups itself into from 10 to 200 endospores. These endospores are released into the tissues of the host by the rupture of the mature sporule and the resulting tissue reaction is of the chronic granulomatous type. The microscopic picture is that of a sporule surrounded by epithelioid cells, giant cells, lymphocytes, and plasma cells with the formation of a tubercle-like structure. If secondary infection takes place there may be an additional infiltration of polymorphonuclear cells. The microscopic picture is typical and should not be mistaken for any other type of granulomatous lesion. On Saboraud's media, the organism

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†Deceased.

develops a profuse white creamy growth which in a period of from four to eighteen days assumes a brownish white cottony appearance. The growth is composed of interlacing mycelia and hyphae with chlamydospores. In culture, reproduction is by budding and possibly by mycelial fragmentation.[5] McNeal and Taylor[6] have reported endospore formation in anaerobic cultures.

CLINICAL FEATURES

Infection of the human host is almost invariably by the respiratory route. During the rainy season the fungus probably grows in the soil and on vegetation. Upon drying the chlamydospores break from the hyphae and are scattered by the wind. When inhaled into the respiratory tract sporulation, extension and reproduction by endosporulation result with the production of the typical granulomatous lesions. Evidence has been adduced to the effect that animals of the endemic areas may serve as reservoirs of infection.[7, 8] In the majority of the clinical cases[2] the invasion is confined to the respiratory system with manifestations ranging from those of localized nodular pulmonary infections of short duration to those of a prolonged septic type of severe pneumonitis with marked prostration, high temperature, chest pain, hemoptysis, mediastinal lymphadenopathy, x-ray evidence of extensive pulmonary infiltration, and not infrequently ultimate death. Pleural effusion is a relatively rare complication.[2] A small minority of the total cases develop into the disseminated type with widespread involvement of almost every organ in the body as well as the lymph glands, muscles, and bones. In these latter cases, cachexia is severe; there are sustained fever, severe cough, elevated white blood counts, sharply increased sedimentation rates, anorexia, and dulling of the sensorium with mild delirium. Treatment in this type is of little avail and the mortality ranges from 90 per cent to 95 per cent.

CASE REPORT

J. B. S., 23 year old colored male veteran, native of Louisiana, was admitted to the Veterans Administration Hospital, Alexandria, Louisiana, on April 21, 1947, complaining of dyspnea, pain in the right chest, cough with marked blood streaked expectoration, night sweats, generalized malaise and weakness. The admitting diagnosis was pulmonary tuberculosis. He had served in the U. S. Army from February 4, 1943, to January 26, 1946, with seven months of foreign duty in France and thirteen months in the Philippine Islands. At the time of discharge from the service (in California) he was entirely well. He worked as a fruit picker and handler in orchards around Bakersfield, California during February, March, April, May and June of 1946. During that period he contracted a persistent "cold" and returned to Louisiana in July 1946. He worked for varying periods of time in a lumber mill at Leesville, Louisiana, but the "cold" and cough persisted and he was never entirely free from it. Four weeks prior to admission to the hospital the cough became worse and he began to have profuse night sweats. He "lost his appetite" and could hardly eat anything. The cough was productive of a yellow phlegm. Four days later he noted a sharp stabbing pain in the right axillary region which was sharply increased on coughing and deep breathing. After about two days the pain in the right chest disappeared but he noticed steadily increasing dyspnea. From that time on his condition became progressively worse with constant high fever, dyspnea at rest, a severe cough with blood streaked sputum, marked anorexia, weakness and continuing weight loss. He consulted a private physician who made a tentative diagnosis of pulmonary tuberculosis and sent him to the hospital.

PHYSICAL EXAMINATION

Physical examination upon admission showed a well oriented, cooperative young colored male who was propped up in bed and uncomfortably dyspneic. He was emaciated, weak, and appeared chronically ill. His admission weight was 120 pounds (a loss of 40 pounds from his usual weight). The oral temperature was 101.8°F., pulse rate 140, and respiratory rate was 30. The right side of the chest was immobile with a flat percussion note, a diminished tactile fremitus and distant bronchial breathing. There was also definite bulging of the intercostal spaces of the right lower chest.

LABORATORY FINDINGS

The red blood count was 3,150,000, white blood count 12,500 with 75 per cent polys and 25 per cent lymphs. The hemoglobin was 9.75 grams. The sedimentation rate was 18 mm. per hour by the Wintrobe method. The urinalysis was normal and the blood Kahn reaction was negative. A roentgenogram of the chest showed a ground glass density of the entire right chest which was indicative of a pleural effusion. A thoracentesis of the right chest resulted in the recovery of 20 cc. of serosanguinous fluid which was negative for tubercle bacilli. Subsequent aspirations produced amounts of thick, greenish yellow purulent material ranging from 20 cc. to 300 cc. in quantity. Large numbers of sporules of *Coccidioides immitis* were evident in both smear and culture of the purulent material recovered at the second thoracentesis. The same

organism was subsequently recovered from the pleural fluid repeatedly. Repeated examinations of the sputum were negative for acid fast bacilli. About one month after admission to the hospital the patient developed large subcutaneous swellings over the right mandibular region, on the outer side of the right forearm below the elbow joint and over the lower portion of the calf of the right leg. These swellings were not acutely inflammatory or particularly painful and did not have the characteristics of acute abscess formation. X-ray examination of these areas was negative for either periosteal or bone involvement. Aspiration of each of these resulted in the recovery of a serosanguinous fluid and the sporules of *Coccidioides immitis* were recovered from all aspirated specimens by both smear and culture. On May 29, 1947, after repeated examinations, the sporules of *Coccidioides immitis* were also recovered from the sputum. A skin test for *Coccidioides immitis* performed on May 27, 1947, showed only a doubtful reaction.

COURSE

The clinical course of the patient was unfavorable. He maintained a constant elevation of temperature ranging from 101°F. to 105°F. The anemia became steadily more marked. Dyspnea was constant and he had severe night sweats, persistent anorexia, and increasing cachexia. Therapy with thymol (1 ounce twice a day) and saturated solution potassium iodide (20 minims three times a day) was of no apparent value. Coccidioidin could not be secured for an immunization program of therapy. From June 30, 1947 to July 21, 1947, patient was definitely stuporous and could be aroused only with difficulty. On July 21, he was practically comatose with a Cheyne-Stokes type of respiration. It was noted on July 23 that his eyes deviated to the right, his pupils were dilated and fixed and his neck muscles were rigid. Spinal puncture on that date showed a clear fluid under normal pressure with an increased number of lymphocytes but nothing else of note. The patient expired on July 24, 1947.

NECROPSY REPORT

Necropsy was performed two hours after death. The body was that of a young, very emaciated colored male. Fluctuant subcutaneous masses varying from 10 to 20 cm. in diameter were present over the right lower jaw, the upper portion of the right forearm and the lower portion of the calf of the right leg. These fluctuant areas contained an odorless, reddish pink, watery fluid from which cultures and smears were made. The meninges were cloudy. Over the brain surfaces there were many nodules of a firm, whitish character, 5 to 10 mm. in size. Sectioning of the brain revealed multiple abscesses in the cerebellum, pons and left lenticular nucleus 5 to 10 mm. in size. These contained a purulent exudate. The right pleural cavity was entirely filled with a greenish yellow thick fluid with an offensive fecal odor and the pleural cavity was lined with a thick layer of greenish yellow fibrinous tissue. The left pleural cavity was not involved. The right lung weighed 75 gms. It was completely collapsed and fibrotic in character. The left lung weighed 275 gms. and was soft and crepitant. However, many multiple gray pinpoint nodules were diffusely scattered throughout the parenchyma of the left lung. The mediastinal lymph nodes were slightly enlarged, friable, and greyish white on section, with evident areas of necrosis. Grossly, the heart was entirely normal. The liver was of medium size with a weight of 1900 gms. and on section multiple small white nodules were found to be diffusely distributed throughout the liver tissue. The spleen was normal in size and apparently uninvolved. The combined weight of both kidneys was 300 gms. The capsule of each kidney stripped readily revealing a pale yellowish brown smooth cortical surface. Sections of each kidney disclosed multiple yellowish white nodules 5 to 10 mm. with necrotic centers. Similar nodules were found in each adrenal gland. The pancreas was not grossly abnormal. No other findings of pathological interest were found in the abdomen.

Bacteriologically, fresh smears and cultures from the involved areas of the brain, both lungs, the liver, the kidneys, the adrenal glands, and from the abscesses of the subcutaneous tissues previously described revealed numerous double refractile bodies 20 to 40 micra in diameter and filled with endospores. These bodies were morphologically identifiable as the sporules of *Coccidioides immitis.*

Sections of tissue from the meninges, brain, lungs, mediastinal lymph nodes, liver, adrenal glands, kidneys, and the areas of subcutaneous swelling noted were prepared with hematoxylin-eosin stain. These revealed granulomatous areas of a tubercle-like character consisting of a central zone of necrotic cellular debris, lymphocytes and polymorphonuclear leukocytes. Surrounding this central zone was a layer of fibrous-like tissue containing epithelioid cells, and about this layer was a zone of circularly arranged fibrous tissue containing many lymphocytes. Scattered throughout the entire tubercle-like mass were many double-refractile bodies 20 to 40 micra in diameter containing either a pale purple homogenous pigment or purplish black endospores. These double refractile bodies were found both free and within large giant cells of the Langhans type and were identified as the sporules of *Coccidioides immitis.*

DISCUSSION

From the clear cut history in this case, it is highly probable that the patient contracted his infection while working as a fruit handler near Bakersfield, California, in the spring of 1946. Following his initial infection there was a long period of many months when apparently the involvement was confined to the tracheobronchial lymph nodes and the pulmonary tissues. The acute

phase of his clinical condition became evident with the involvement of the right pleural space either as the result of direct extension from the right lung through the visceral pleura or by involvement of the right pleural space either by a lymphogenous or a hematogenous spread. It is noteworthy that the first fluid recovered from the right pleural cavity was serosanguinous in type and that the same type of fluid was also found in the subcutaneous areas of involvement. The subsequent development of frank pus in the right pleural cavity was undoubtedly due to secondary infection either from a subpleural abscess of the lung itself or of external origin. Within a short period of time after the right pleural involvement became evident the patient developed a widespread disseminated type of coccidioidal infection in such diverse tissues as the brain, lungs, liver, spleen, adrenal glands, kidneys, and the subcutaneous tissues. This dissemination was in all probability by way of the blood stream although it is noteworthy that no evidence of pathology could be found in the heart itself. The morphological development of the lesions quite evidently consisted first of multiple tubercle formation followed by coalescence of these tubercles and necrosis of the areas involved with abscess formation. These findings were particularly notable in the brain, the tracheobronchial lymph nodes, the adrenal glands and the kidneys.

It is interesting to note that our patient was of the Negro race. Jamison[2] has pointed out that Negroes, Mexicans, and Filipinos show a greater tendency to dissemination of coccidioidal infections than white patients and he has expressed the opinion that dissemination is at least one hundred times more common in Negro than in white patients. Also the patient had a right pleural involvement as well as an extensive meningeal and brain involvement. Both of these complications are relatively rare.

Although a large amount of information has been collected concerning fungus infections in general and, with improved diagnostic methods, diagnoses of fungus infections particularly of the respiratory tract are being made with increasing frequency, the treatment of these conditions in general is far from satisfactory. The usually recommended treatment with thymol and potassium iodide was of no value in this case and in all probability is of little value in any case of fungus infection. Despite strenuous efforts to do so, we were unable to secure any coccidioidin for an attempt at the immunization method of therapy.

The importance of an adequate clinical history is emphasized by developments in this patient. During the recent war many thousands of soldiers received training in desert areas in which infection with *Coccidioides immitis* is endemic and these thousands of military personnel are now scattered over the entire United States. In addition, itinerant workers as well as tourists may also contract the disease as is demonstrated by this case. It is fortunate that the great majority of such infections are of a relatively mild character, confined solely to the respiratory tract and heal without specific treatment because of the self-sufficient resistance of the host. Certainly, at present, clinical medicine has little to offer these patients in the way of any specific treatment.

SUMMARY

1. The third case of widely disseminated infection with *Coccidioides immitis* occurring in Louisiana is presented. The patient was a young Negro male veteran. This case terminated fatally despite clinically adequate therapy with the usually recommended methods. The postmortem findings are described in detail.

2. The patient probably contracted the infection while working as a fruit picker and handler in an endemic region of California. The disease was apparently confined entirely to the respiratory tract for a period of more than a year. A period of relative quiescence was followed by right pleural involvement, widespread dissemination, and death.

3. The value of a good clinical and environmental history is emphasized. The treatment of such infections is discussed briefly.

4. The admitting diagnosis was pulmonary tuberculosis. Fungus infections particularly of the respiratory tract must always be considered in the differential diagnosis of chronic pulmonary lesions.

5. Racial factors may be responsible for the high tendency to widespread dissemination with resulting relatively high mortality occurring in cases of *Coccidioides immitis* in the Negro.

6. Because of the frequency and extent of travel as well as the fact that many thousands of military personnel were trained in endemic areas during the recent war, clinical cases of infection with *Coccidioides immitis* may be encountered in the practice of any physician anywhere in the United States. Physicians in general must be alert to this possibility.

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REFLEX SYMPATHETIC DYSTROPHY

SHEA HALLE, M. D.*

NEW ORLEANS

A wartime experience prompted Weir Mitchell[13] and his associates to publish in 1864 a dramatic account of a syndrome which he referred to as causalgia. Intractable and tormenting pain was the striking feature of this illness, and accompanying it were definite signs of nerve dysfunction as evidenced by marked trophic and vasomotor disturbances. To Mitchell, causalgia was the result of peripheral nerve injury. More recently, reports have appeared of cases similar in many respects but with varied etiology. In these a heterogeneous array of names have been applied, among which are the following:[3, 5, 7, 8, 10, 12]

1. Causalgia
2. Minor Causalgia
3. Reflex Arterial Spasm
4. Reflex Dystrophy of the Extremities
5. Trophic Edema
6. Traumatic Osteoporosis
7. Sudeck's Atrophy
8. Post-Traumatic Painful Osteoporosis
9. Peripheral Acute Trophoneurosis
10. Chronic Traumatic Edema
11. Reflex Sympathetic Dystrophy
12. Phantom Limb Pain
13. Shoulder-Hand Dystrophy

These names indicate that they all refer to the outstanding manifestation of a pathologic process which, as will be shown, is common to all.

What then links these apparently different entities? Common to all is a precipitating trauma or inflammation, varying from a gunshot wound of nerve, as in Weir Mitchell's cases, to a simple sprain, a burn, an injection of drug, or a thrombophlebitis. A superficial glance at the entities cited reveals a wealth of apparently dissimilar manifestations, but this is essentially a quantitative difference. Pain is present in nearly all cases, but varies from an excruciating severity to a mild ache. A peculiar osteoporosis[18] (Sudeck's osteoporosis) is common to most, also varying from a negligible degree, not visible roentgenologically, to extensive involvement. Vasomotor changes may appear to be opposites but are proportional to the tone of the peripheral vessels. Thus, if vasoconstriction predominates, there is a cold, pale, sweaty, glossy skin; if vasodilatation, there is a dry, warm, red skin. Other trophic and vasomotor changes correlate well with the underlying degree of vascular tonicity. These findings indicate a common denominator for the superficially dissimilar manifestations: dysfunction of the autonomic nervous system. The burning pain, the

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vasoconstriction, or vasodilatation, and resulting trophic changes, all represent an altered state of the autonomic nervous system. Since sympathetic surgery has given marked improvement, the tendency has been to place the fault entirely on altered sympathetic function, but there is no real proof that the parasympathetics are not involved.

Mechanisms attempting to explain all these observations are numerous. There is some agreement that an initiating trauma sets up a nidus which reflexly discharges stimuli through the sympathetics or parasympathetics, with resultant dysfunction. This concept of a reflex mechanism with secondary dystrophic changes, referred to as reflex sympathetic dystrophy, is widely accepted at present as one that encompasses all the entities named.

PREDISPOSING CONDITIONS

Many diseases have been thought to be the precipitating factor in reflex sympathetic dystrophy, with four main subdivisions ordinarily used. Common to all are trauma or inflammation, in the broad pathologic sense.[1, 3, 6, 12, 13, 16, 18, 21]

1. Infectious Inflammatory. Gonorrheal arthritis, tuberculous arthritis, felon, cellulitis of tendon sheaths, inflammation of soft parts, freezing and burning injuries, immersion injuries, osteomyelitis, subdeltoid bursitis, periarthritis (Rheumatoid arthritis?).

2. Neuritic. Peripheral neuritis (alcoholic, toxic), Guillian Barre syndrome, gunshot wound of nerves (partial, especially median, tibial, sciatic, ulnar, radial and peroneal). Angina? Raynauds?

3. Thrombotic. Thrombophlebitis, thromboarteritis, arteritis, Buerger's disease.

4. Acute Traumatic. Fracture (especially near joints), luxation, torn ligament, sprain, direct blow, hematoma, traumatic synovitis, bismuth (and other drug) injection near veins, nerves or arteries.

In all of these there is some disturbance which may serve as an initiating nidus or stimulus for the discharging of nervous impulses in a reflex manner. Many such lesions involve inflammation of nerve, perivascular and periarthritic tissue, the usual explanation being that trauma or disturbance of nerves or blood vessels (with their heavy perivascular nerve supply), or periarticular structures (where nerve endings are also particularly plentiful), has a greater chance of starting the abnormal reflex mechanism. In the next few years other clinical syndromes undoubtedly will be found to have reflex sympathetic dystrophy contributing a large part to their picture.

SIGNS AND SYMPTOMS

The clinical features presented by these patients vary, as might be expected, depending upon the phase of autonomic imbalance predominating.

Mitchell[13] described most of his cases as having a burning pain, agonizing in nature, as the earliest complaint. Other descriptions of the pain are "burning", "red-hot file rasping the skin", and "mustard red hot". These patients may develop elaborate rituals to protect the injured part, such as using wet rags. They behave like the classic tic douloureux patient who cannot tolerate even a whisp of wind or sudden noise because such disturbances aggravate the pain. These, however, are the extremes of pain, and are found in cases described as causalgia. In minor causalgia or posttraumatic painful osteoporosis the pain is much less severe.

The distribution of pain is often bizarre. It may follow a classical nerve distribution, especially if the underlying lesion is a peripheral nerve injury. Frequently, however, there is no characteristic neurologic distribution. If it does not follow the segmental distribution of peripheral nerves, the cause is probably stimulation of periarterial, perivenous, or other nerve plexuses which are supplied to the vessels in a segmental pattern, and which synapse with radicular elements going to a distant skin area. In general, causalgic pain is most common in the palms of the hands and dorsum of the feet. When peripheral nerves are injured the pain usually follows the nerve distribution. Mitchell[13] comments that causalgia occurs only in nerve injury and not in com-

plete nerve severance. With the latter the predominant picture is that of marked paralysis, edema of involved area and thickened, dry skin but with no significant pain.

The pain is followed usually by vasomotor and trophic changes which may occur immediately or only weeks later. Often, because there is a delay in objective signs, many of these patients are considered neurotic or malingering. Progressive trophic and vasomotor changes result in a smooth, hairless, glossy skin, cyanotic and wrinkle-free. The skin gradually loses its elasticity, and there is shrinkage of the subcutaneous tissue. The nails develop increased curvature in their longitudinal axis, and there may be retraction of the cuticle leaving an exposed sensitive nail matrix. Sweating over the involved area may be absent, diminished, or increased, often with altered odor. In some cases a periarticular swelling develops which may progress to periarticular fibrosis and partial ankylosis. Vasomotor and trophic changes can vary markedly.

There are two predominant types of picture:

1. Sympathetic hypertonia with vasoconstriction predominating. This is the more common. The extremity or involved area is cold, pallid or cyanotic, the skin thin and glistening, with profuse sweating. Also there is loss of hair, tapering of digits, and curvature of nails. Relief may be gained by measures that promote vasodilatation, i.e., application of heat or generalized febrile reaction. Subjectively the involved portion feels cold. Subsequent "hard" edema may develop.

2. Sympathetic hypotonia with vasodilatation predominating. The extremity or involved area is warm, hyperemic, dry, often scaly, but not glossy. The hair is long and coarse. There is loss of elasticity of the skin, with atrophy and decreased subcutaneous tissue, with marked wrinkling and decreased sweating. Relief may be obtained by the application of cold or other measures resulting in vasoconstriction. In both types hyperesthesia is frequently noted, with or without patches of anesthesia in and around the hyperesthetic zones.

Thus there may be found two distinct pictures, each of which may be associated with unbearable causalgia-like pain or pain of lesser degree. They fall definitely into line with the type of autonomic imbalance present, can occur soon after injury or later, and can change one into the other. The vasodilatation phase, if it occurs, usually precedes the vasoconstriction phase. Mitchell, like most observers, found the vasoconstriction type to predominate. Later a physiological mechanism that may explain the relative predominance of either type will be offered.

Bone and joint changes are an important part of the picture also, but, like the rest of the syndrome, inconstant. These can occur in either type, despite the fact that experimental histologic examination[16] has consistently found vasodilatation in the bones showing acute spotty bone atrophy, or Sudeck's osteoporosis. In the bones there is fairly characteristic spotty atrophy appearing in four to six weeks, demonstrable by x-ray. Usually it occurs in the metaphyseal and epiphyseal areas, especially of the metacarpals and metatarsals. Serial x-rays are important in picking up the early coarsening of trabeculae and other changes leading to the spotty, and ultimately generalized, osteoporosis, due to the fact that all degrees of bone changes may occur and may stop at varying levels. The cancellous portions of the carpals, the tarsals and the metaphyseal region of the long bones may also be involved. These sites are supposedly most sensitive to the changes because they are the most vascular parts of the bones, and thus most sensitive to the hyperemia that has been hypothesized as accompanying the sympathetic dystrophy. Many workers are confident that the bone lesions are due to a hyperemia of bone, but this necessitates the task of reconciling vasodilatation in the bone with vasconstriction in the skin and other involved tissues. An intensive histologic and x-ray study by Rieder, and other European and American work-

ers,[12, 16] demonstrates vasodilatation in clinical and experimental cases of Sudeck's atrophy, which is the name applied to a type of reflex sympathetic dystrophy in which spotty osteoporosis is prominent, but this work is controversial. Some consider the bone changes as secondary phenomena, and not an important part of the clinical syndrome that is being considered. It should be noted that after long progression the spotty osteoporosis of Sudeck may blend and become obscured with development of a generalized osteoporosis of disuse.

An important cause of disuse is the joint changes that may occur. Early there may be periarticular edema which subsequently undergoes transition to a periarticular fibrosis with ankylosis and loss of joint junction. Also described is pannus formation[16] in the joint's synovial membrane with cartilage destruction and ankylosis. Some of these changes resemble the pathologic findings of rheumatoid arthritis, e.g., the pannus formation, periarticular fibrosis, and vascular derangement. Further work with the sympathetics may cast more light on that disease. It may be that some types of rheumatoid arthritis are actually peculiar types of reflex sympathetic dystrophy and may respond to sympathetic surgery. Use of therapeutic measures to be discussed later certainly deserve investigation in that disease.

DURATION AND SEVERITY

There is no way of predicting duration and probable severity of these dystrophic cases. They may remit at any time after weeks or months, and the severity may seemingly be out of proportion to the underlying lesion.

MECHANISMS

Examination of the clinical syndromes strongly suggests that the autonomic nervous system is involved in the manifestations of the disease process, whether causalgic pain or spotty osteoporosis is present, whether vasomotor and other trophic disturbances are the main manifestations, or whether there is sympathetic hyperactivity with the cold, sweaty hand, or hypoactivity with the warm, hyperemic hand. Leriche and others were impressed enough with these findings to attempt surgery of the sympathetics, e.g., periarterial sympathectomy, ganglionectomy, and ramisectomy, and their successful results helped incriminate an altered autonomic nervous system as the basis for the disease processes. To explain all the varied findings many workers have advanced neurophysiologic mechanisms and much work has been done in experimental laboratories. The definitive work, however, is still undone. A brief summary of some of the mechanisms offered helps visualize the possible background and etiology of the syndrome.

A. Doupe, Cullen and Chance[5] have advanced the theory that causalgic pain is due to activation of sensory fibers by the overflow of sympathetic impulses. Thus, inflammation stimulates sympathetic nerve impulses which alter the excitability of adjacent fibers. Since the sympathetic fibers in mixed nerves run alongside posterior afferent sensory fibers, they can influence them by "overflow of impulses". This can occur at the site of or distal to injury to the nerve. It is supposedly due to peripheral nerve nutritional changes which disturb the insulation between sensory and sympathetic fibers. This offers an explanation for nerve block peripheral to an injury relieving causalgic pain and explains the value of sympathectomy since it blocks excessive efferent impulses.

B. Homans[7] offers a tentative theory based on Moore's findings[14] of sensory nerves in arteries and veins. Irritation of these endings in vascular damage causes afferent impulses which go to the cord, synapse with sympathetic fibers, and then go to the extremity thus causing the changes. There may also be local reflexes with the sensory nerves in the arterial walls joining sympathetic fibers in the walls of the larger vessels. This could offer an explanation for the relief obtained by arterial and venous wall nerve stripping, and also for the success attained with sympathetic surgery.[9]

C. Sir Thomas Lewis' axon reflex[11] also

has been adapted by Miller and DeTakats[12] to explain the syndrome. This theory hypothesizes that in response to stimuli of the peripheral nerve, there is a peripheral reflex effect within the distribution of the nerve without need for impulses to return to the central nervous system. The vasodilator efferent fibers of the posterior root system secrete a pain substance locally which causes the characteristic hyperalgesia, vasodilatation, and hyperesthesia. Sympathetic block here presumably accelerates circulation by promoting vasodilatation and overcoming spasm. Thus, the increased blood flow washes away the pain substance ("Nocifensor" substance of Lewis). This may also explain success often obtained by blocking a nerve distal to an injury. Added support for this theory is the relief of pain achieved in cases of herpes zoster following paravertebral block.[12]

D. Other concepts include the internuncial pool of Lorente de No[2] which Livingston[10] has adapted. Persistent pain stimuli from the site of trauma set up a vicious cycle of reflexes which spread through a pool of many neuron connections upward, downward, and across the cord, with resultant discharge of impulses along the sympathetic nerves controlling vasomotor tone, and sweat glands.

E. Rieder[16] and others[12] have done elaborate histologic examinations of bones with x-ray correlation, in large series of clinical and experimentally produced acute spotty bone atrophy (Sudeck's atrophy), and found that vasodilatation was consistently present in the bones. Rieder concluded that vasodilatation with resulting congestion produces a local acidosis which promotes calcium dissolution in the bones with resulting osteroporosis. Also there is relatively diminished osteoblastic activity. Congestion can also account for the vasodilatation type of syndrome. However, this does not explain the vasoconstriction type which can often occur following injury with no preceding vasodilatation apparent clinically.

F. A suggestion as to the cause of relative predominance of vasodilatation or vasoconstriction can be cited.[3, 12, 15] Strong stimulation of the central end of an afferent nerve elicits a pressor effect, whereas weak stimulation produces depressor effects. This simple physiological finding may be the explanation.

The mechanism is thus not settled. Several of the explanations offered may play a role, and there may be predominance of different mechanisms in different types of the syndrome. Whether sympathetic fibers can carry afferent impulses and vasodilator fibers, or whether posterior root sensory fibers can carry vasodilatation fibers, are problems being worked out. The old law of Bell and Magendie has been modified. Further knowledge of the autonomic nervous system may elucidate the problem. However, the possibility of an additional "physiological" nervous system such as the "nocifensor" system of Lewis; may enter into consideration. Nevertheless, the theories discussed here are often good rationalizations which help visualize the cause of signs and of symptoms, and the response obtained from present therapeutic methods.

MANAGEMENT

Prevention[16] is an important part of the management of the syndrome. This is usually a surgical or orthopedic problem, e.g., fracture reduction and immobilization; careful repair of torn muscles, tendons, and tissues; evacuation of hematomas and foreign bodies. The principles of surgical technic provide for these problems. However, most trouble comes from lesions not so amenable to surgical treatment, e.g., diffuse phlebitis and arteritis, sprains, nerve injuries, freezing and burning injuries. To attempt to protect these patients from reflex sympathetic dystrophy, pain must be relieved; infiltration of sprains, painful hematomas resisting evacuation, and trigger areas that set off painful sensations, is recommended. Early ambulation may be helpful. Excision of foci responsible for pain and reflex phenomena also aids some patients, e.g., excision of inflamed sections of arteries or veins, lysis of bound down nerves, and resection of neuromas. Further, a sympathetic block, as early as necessary,

via peripheral nerve or paravertebrally, may head off the reflex dystrophy.[16, 20]

Because of the numerous etiologic possibilities suggested, therapeutic measures and their time of indication must be set down in general fashion. Thus, for edema elevation may be helpful. Rest may be very important with properly timed introduction of active and passive movement, alternating baths and Buerger's exercises. Narcotics may play a big role, because continuous pain upsets the personality and the autonomic nervous system on a very high level, with resulting lowered pain threshold and magnification of pain. Upsetting of the autonomic nervous system may also cause vasomotor changes further promoting discomfort. Thus, as is always the case, care of the patient as a whole must be considered. Failure to understand the vagaries of sympathetic imbalance may easily cause the patient to be termed a malingerer or pension seeker.

Despite all these measures and the best of management many patients develop dystrophy syndromes. The severe type of causalgic pain may lead to suicide or amputation. For these extreme cases there are several therapeutic approaches possible.[9, 10, 21, 22]

A. Repeated "Trigger Point" infiltration with procaine offers some success. This presupposes existence of a focus, e.g., a scar, stimulation of which sets off the syndrome of pain.

B. Sympathetic blocks, paravertebrally usually, repeated as frequently as necessary are very valuable. These may be needed daily or less often. Concomitantly there is utilized massage and other physical therapy, because the blocks often relax the joints and relieve pain sufficiently long to carry on manipulation.

C. Sympathectomy. 1. Preganglionic sympathectomy is most widely used.[21] This is a recent advance and is based on at least two pertinent findings. First, postganglionic fibers tend to regenerate, whereas preganglionics show less tendency in that direction. Second, severance of the postganglionics causes a hypersensitivity of the supplied end organs, so that when adrenalin is later released into the blood there is a hyperresponse from the affected parts with increased pain. It is important to note that paravertebral blocks often give no inkling to the possible success of a sympathectomy, and failure of a block is no contraindication to the surgical procedure. This procedure is very valuable; it has given excellent results in many severe, chronic cases of reflex sympathectomy dystrophy. It has been applied widely with some success and may be used in certain cases of Buerger's disease[4] and Raynaud's disease.[1] Some results of value have been reported lately in cases of intractable angina, shoulder-hand syndrome, and the cryopathies[17, 19] (frostbite, immersion foot cases). As with any therapeutic measure, the indications and contraindications must be considered.

2. Periarterial and perivenous stripping is a procedure that has been advanced most strongly by Leriche.[9] It has some value but its indications are definitely restricted. It is of especial value in localized phlebitis and arteritis, and in segmental thrombosis or embolized vessel, for local resection or ligation of a vessel with simultaneous stripping of the perivascular nerves. Thus, in thrombophlebitis with ligation of the femoral vein to avoid embolic phenomena, dramatic results are often seen immediately postoperatively (relief of pain and spasm), probably due to the stripping of the vessel before ligation with interruption thereby of the reflex dystrophy. In general, Leriche urges that this type of procedure is best applied in cases of distal injury where the artery can be stripped in the most proximal part of the arm or thigh. Otherwise it is difficult to get up high enough to interrupt nerves going to the involved area.

D. Drugs are new in this field. Tetraethyl ammonium compounds act on the sympathetics over the entire body. Many extravagant claims are being advanced for them. Whether they may be of value is not clear, but they deserve further experimental attempt. Other European work[9] has been going on for years with use of large dosage of salt or partial suprarenalectomy,

under a working hypothesis that increased salt will inhibit adrenal activity and stop the outpouring of adrenalin. This poses a a relationship between the adrenal cortex and medulla which is still obscure. However, Russian workers have long experimented in this field, especially in the treatment of Buerger's disease, and they claim good results. As is usually the case in medicine, new drugs probably will obviate the use of surgical procedure. However, at the present, surgical manipulation of the sympathetic nervous system is our chief weapon.

DISCUSSION

There must arise some skepticism over grouping of cases of causalgia, phantom limb, minor causalgia, Sudeck's atrophy and others under a common syndrome. It is true that the causalgic types have a severe pain that overshadows all other manifestations; whereas in other types there may be burning or aching pain of lesser severity which does not dominate the picture but rather shares attention with the vasomotor and trophic changes. However, all the entities mentioned in the introduction, share many mutual characteristics, and their difference is one of degree, a matter of hyperactive or hypoactive sympathetics. Likewise they also share a response to therapeutic manipulation of the sympathetic nervous system, for example, sympathetic block and sympathectomy.

There are other conditions, well known in medicine, which show many of the manifestations of reflex sympathetic dystrophy, but apparently lack the reflex mechanism[3, 12] These are probably due to a central disorder of the autonomics, in the spinal cord or brain, or possibly in the peripheral nerve. Hemiplagia is one such entity. In the hemiplegic limb there may be evidence of sympathetic imbalance (burning pain, increased warmth, osteoporosis), all ascribable to constant vasodilatation possibly caused by irritation of the central sympathetic center. Sweating may be altered also, and the sweat of the hemiplegic limb may have a peculiar odor. The fingers and toes are often glossy and show an increased nail curvature. Theoretically these manifestations may respond to a sympathetic block. Often the pain is ascribed to altered muscle balance, or considered thalamic in origin. When severe enough, sympathetic block should certainly be tried. Unfortunately the upper extremity is more often the site of disturbance, and stellate block is not without its own danger.

Another example of nonreflex sympathetic dystrophy is poliomyelitis in which the involved limb may show cyanosis, coldness, mottling, scaling, or glossiness of the fingers or toes. There may be marked exacerbations in cold weather with severe pain. Sympathectomy or block may relieve the pain and allow warming of involved area, and should be considered as a possible therapy. Here again the site of involvement is central, probably with changes in the lateral horns or anterior roots.

There are numerous other disease entities of the brain and spinal cord wherein a subsidiary consideration may be irritation of a sympathetic center or tract. In these cases sympathetic surgery should be considered. However, when there is trophic change due to anesthesia of an area and other unexplained causes, as in tabes and syringomyelia, or when there is complete nerve severance, reflex sympathetic dystrophy is not seen, and sympathetic surgery is usually without result.[3, 12]

CONCLUSION AND SUMMARY

Causalgia, Sudeck's atrophy, trophoneurosis, and other post-traumatic entities are all manifestations of a single syndrome and should be considered as types of reflex sympathetic dystrophy. Although the etiology may vary widely from gunshot wounds of nerve, to slight sprain or thrombophlebitis, the mechanism seems to be a reflex, with afferent loop constantly bombarded by impulses from the nidus of injury, and with the efferent loop (the sympathetic nervous system) showing either hyperactivity or hypoactivity. The exact mechanism is not settled.

The syndrome of reflex sympathetic dystrophy is more important at this time because timely use of a relatively new surgical

weapon, sympathetic block and sympathectomy, may prevent development of, or may cure many severe dystrophic states.

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HYPERTENSION TREATED BY IRRADIATION OF THE ADRENALS; WITH REPORT OF TWENTY-THREE CASES*

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Shambaugh and Cuttler were the first to discuss the possibility that adrenalin discharges may be involved in the pathogenic mechanism of angina pectoris. Following the work of Raab, Soule, and Bougoslavskaia in the roentgen therapy of angina pectoris, hypertension, claudication, postcoronary angina of effort, Buerger's disease, and the so-called angiospastic individuals, we treated a series of 23 cases. Our efforts were directed toward evaluating the methods and results of the various investigators.

We wish briefly to summarize the rationale of this form of therapy and acquaint you with the technic together with the breakdown and clinical findings both before and after therapy.

The theory advanced by Raab that anginal attacks are brought about actually by the anoxiating effects of adrenalin discharges upon a heart muscle whose coronary arteries are sclerotic, and thus unfit for adequate compensatory dilatation, is based on the following facts:

1. Adrenalin exerts a specific, intensely anoxiating effect upon the heart muscles which by far exceeds the oxygen requirement for the simultaneous increase of hemodynamic action.

2. Adrenalin is physiologically discharged from the adrenal glands into the blood stream under the influence of physical exercise, emotions, cold, under the very conditions which usually elicit anginal pain.

3. The heart muscle possesses a greater tendency than other tissues to accumulate circulating excess amounts of adrenalin, and likewise accumulates other adrenal catechols.

4. During physical exercise or exposure to cold the adrenalin content of the heart muscle increases while that of the adrenal gland diminishes.

5. Injection of adrenalin is likely to produce anginal symptoms in persons with coronary sclerosis and, if given in large doses, also in healthy persons.

6. Abnormal intense discharges of adrenalin to the blood stream during physical exercise were observed in a number of Raab's patients suffering from angina pectoris. They disappeared in all of the suc-

*Presented before staff of Baton Rouge General Hospital May 21, 1947.

cessfully treated patients in whom the tests were repeated after treatment.

7. The electrocardiographic changes which occur during anginal attacks are practically identical with those following the administration of adrenalin.

8. Patients with tumors of the adrenal medulla often suffer from anginal attacks during which an increased adrenalin level was found in the blood, and which disappeared after removal of the adrenal tumor.

9. Conditions which are known to increase the secretion of adrenalin, such as tobacco smoking, or overdosage of influenza, or breathing of low oxygen concentrations, are likely to elicit anginal symptoms.

Recent experiments by Raab and Soule showed that irradiation of the adrenal glands by single doses of 100 and 1000 roentgens caused slight changes in the contents of the glands in adrenalin and related catechols within two months. The accumulation, however, of such hormonal material in the heart muscles following physical exercise was distinctly diminished two months after irradiation.

Desjardins, Frey, and Engelstad conclude that the roentgen ray sensitivity of the normal adrenal is not greater than that of other tissue; however, the roentgen ray sensitivity of living cells increases with the degree of activity (Holzknecht's law), and the state of overactivity of the adrenal medulla, as well as its nervous secretory apparatus, which seems to prevail in angina pectoris patients, and makes for the possibility of normalizing effects of roentgen therapy upon the adrenals and their nerve supply in these patients, even with a dosage which does not suffice to cause damage to the glands.

At this point it might be mentioned that in some cases it was noted that a second extracardiac factor is essential for the occurrence of pain, namely an abnormal sensitivity of the thoracic sympathetic nerves. Raab irradiated 18 patients over this area, in addition to adrenal irradiation, obtaining excellent results.

In the fine work done by Raab and Soule in 1940 they reported success in 76 of 100 patients irradiated over the adrenals. Electrocardiograms, blood pressure and effort tests bore this out. Most patients had undergone other therapy without effect or with unsatisfactory results. The mainstay of the previous therapy had been in most cases vasodilating drugs.

Complete, or almost complete, disappearance of anginal symptoms for three to thirty months occurred in 40 per cent of these cases; considerable improvement for six to twenty-four months in 20 per cent; and moderate improvement for six to seventeen months in 15 per cent. In this series one course of irradiation proved effective for 21 patients. Of the remaining, 55 improved, 22 received two courses, 26 three courses and 7 four courses.

To the 24 unsuccessfully treated patients only two courses were given and failures probably could have been reduced by extension of the treatments to one or more additional courses.

Onset of improvement varied from beginning during the therapy to two months after completion, while in most cases it ran between two and four weeks. (The findings correspond with experimental findings in animals whose suprarenal glands showed beginning histologic changes in from a few days to six weeks after irradiation).

In a later report Raab and Soule had a series of 42 cases. In a great percentage of this series the thoracic sympathetic area was irradiated as well as that of the adrenal glands and the percentage of improvement was approximately the same as that discussed previously but improvement lasted up to forty-five months. No symptoms of adrenal insufficiency have been noted in any of the treated cases. Some of the workers routinely treat the paravertebral area extending from the sixth cervical to the lower dorsal as well as the suprarenal gland, and some workers treated only the dorsal sympathetic chain, notably Susmann, Samuels and Bowie, Wasch, Schenk, and others.

T. V. Bougoslavskaia, following the meth-

od of Raab, used irradiation of the adrenals with 31 cases of hypertension with the following results:

1. In 11 patients the blood decreased from 40 to 50 mms. for the systolic and 10 to 30 mms. diastolic after one course of treatment.

2. The general condition of 6 patients improved and their working capacity was restored though there was little change in blood pressure.

3. Twelve cases showed no effects.

In our series we treated the adrenal glands and arranged the size of our field so that the lower dorsal sympathetic chain would be included during each treatment.

Our technic was the use of 250 Kv. at 15 M.A., 50 cms. target skin distance using a filtration of 1 mm. of copper plus 1 mm. of aluminum. The field as described was over the adrenal and lower dorsal sympathetic chains using a cone 15 x 15 cms. The patient was given six successive treatments alternating the right and left sides so that at each treatment 250 roentgens skin dose was delivered. Nausea was the main side effect to be avoided or controlled as much as possible, which we did by instituting a high vitamin B complex intake orally at the beginning of each course of therapy. In some instances the B complex was given hypodermatically, but mostly in oral form using the basic formula of Squibb's, one tablet at each meal and one before retiring.

There are four definite contraindications to therapy:

1. Symptoms of primary adrenal insufficiency.

2. Coronary thrombosis within the past three months.

3. Tuberculosis of the kidney or peritoneum.

4. Cardiac decompensation.

For the grouping of these cases we have selected the classification of hypertensive diseases as used by Hines.

I. VASCULAR HYPERREACTIVE

Persons having a hyperreactive vascular system, seen most commonly in young people. By taking frequent blood pressure readings variable blood pressures are found. This is really vasomotor instability and is thought to be the early forerunner of hypertensive disease. No one knows the end results of these cases, very little work having been done on this problem. Many of these cases were observed in the service during the war, but the follow-up on them in years to come is not very likely ever to be accomplished.

Case No. 1. White female, age 24, first seen February 6, 1947. Chief Complaint: Pain in left chest (anginal in nature), exaggerated on exertion, duration of two years; radiated around the chest and once down the arm. Nauseated during attacks.

Examination: Blood pressure 140/80; head negative; chest negative; heart no murmurs; pulse 112/min.; abdomen negative; no vaginal done; temperature 97° F.

Laboratory: RBC 4,310,000; WBC 8,800; Differential S.L. 27, L.I. 4, P. 69. Hb. 76 per cent. Agglutinations all negative. Wasserman negative.

X-ray: Chest negative.

Electrocardiogram negative.

Treatment: Nitroglycerine 1/150 gr. Patient stated that she got relief in five to ten minutes after taking nitroglycerine tablets under the tongue, with no change in the frequency of attacks. Deep x-ray therapy to the adrenals was given (six treatments).

Results: B.P. 128/78, pulse 98. Relief of symptoms. Patient stated she had an occasional tightness in the chest when tired but no pain.

Case No. 2. White male, age 22, first seen August 26, 1946. Chief Complaint: Buzzing in ears for eleven months; flash across left eye; worried about his blood pressure. Stated that he had had trouble with fluctuating pressure ever since he entered the service, that he had difficulty getting into the service and had failed the Air Corps examination on several occasions while in the Army.

Examination: B.P. 168/80, Pulse 112/min.; head negative, eye grounds negative; chest negative; heart A2/P2, no murmurs noted.

Laboratory: Urine negative; blood studies negative except for positive undulant fever agglutination, 1 to 80. This was rechecked and found to be the same.

Electrocardiogram essentially negative.

X-ray of the kidneys for a possible Goldblatt kidney negative. X-ray of chest negative.

Blood pressure readings varied from 170/100, 160/98, 155/90, 130/80, 140/90, 138/80. (He stated it had been 160 while taking an examination at L.S.U. Medical Infirmary.) These readings extended over a period of six months.

Treatment: During the first six months only

the usual mild sedatives and vitamins were given with very little relief of symptoms and no apparent change in the fluctuating pressure.

Deep x-ray therapy was given (six treatments to the adrenals). Blood pressure the day treatment was begun was 160/98. Reading following the treatments was 132/78. Relief of symptoms. Reading fourteen days after 132/80. Immediately after exercise 170/100. Two minutes after exercise dropped to 132/80. He has had a complete relief of symptoms and has since passed the Navy air service examination.

Comment: There is no question that this young man has been helped by this treatment. The question whether it will hold up cannot be determined. Hyperactive adrenals will probably give him more trouble unless further treatment is received.

II. LATENT HYPERTENSION (ARTERIOSCLEROSIS)

Persons of older age having a hyperreactive hypertension, may not develop a fixed hypertension but a variable one. As they grow older, they do show definite hypertensive changes such as eye changes, renal changes, and symptoms such as angina, claudication, cerebral symptoms. These cases may or may not have a severe hypertension.

Case No. 1. White male, age 44, first seen November 6, 1946. Chief Complaint: Headache, vertigo most marked after a day's work. No angina or chest pains. History of having had high blood pressure for several years.

Examination: Blood pressure 210/110; head negative; eye grounds negative; chest negative; heart A2/P2, no murmurs; pulse 90/min.; urine negative.

Treatment: Deep x-ray therapy to adrenals (six treatments). Reading of blood pressure 176/100, ten days after.

Results: One month after treatment blood pressure was 149/100, no symptoms. Two months after, blood pressure 170/100, noted the diastolic changed little; three months after, blood pressure 170/90; five months after 196/100. It was decided at this point to give him a second course of treatment which was done (March 1947).

Results: Blood pressure 162/90. Whether this pressure will climb back again remains to be seen. At the present he can be classified as relieved.

Case No. 2. White female, age 64, first seen November 1946. Chief Complaint: Cramplike pains in the region of the heart which radiated down the left arm, exaggerated on exertion or excitement. Very nervous, up 4 to 6 times every night to urinate. Vertigo all the time, stated that when she walked she pulled to the right side.

Examination: Blood pressure 230/120. Pulse pressure 110, pulse 88/min.; head negative, eyegrounds negative; chest negative; heart, no murmurs, regular; abdomen negative, vaginal negative. Urine negative.

Treatment: Diet, sedatives, T. C. S. laxative. After one month blood pressure 200/90, little relief in symptoms. Deep x-ray therapy to adrenals (six treatments).

Results: Blood pressure 170/90, complete relief of symptoms; two months after treatment, blood pressure 168/80. No complaints or return of symptoms. Six months after treatment, blood pressure 170/90. Stated that she had been visiting in Texas for a month and had felt no return of symptoms. At present she is relieved of her symptoms.

III. ESSENTIAL HYPERTENSION (DIFFUSE VASCULAR DISEASE)

Divided into four groups graded by the eyeground findings (severity of retinal changes). This group is better called the diffuse vascular disease, progressing over a period of years with a gradual rise in both the diastolic as well as the systolic pressure. The pathology of the arteries is not sclerosis, but fibrosis replacing the elastic tissue of the entire vascular tree. Cardiac and renal symptoms come very late if at all. Their danger lies in the cerebrum when the end does come. Many live a normal life span in spite of their pressure which is gradually progressive from Group 1 to 4.

Case No. 1. White female, age 43. Chief complaint: Severe headaches, accompanied by nausea; blurring of vision, nervousness. These symptoms were progressive over a period of eighteen years. I first began treating this patient twelve years ago at which time she had hypertension around 200 with an elevated diastolic. This pressure has gradually risen more and more each year. Blood pressure of 300/160 has been recorded on one or two occasions. It averages around 240/130 to 260/140 most of the time. Eyeground changes in class 3.

Treatment: This patient has progressed through all the past treatments as they came into vogue, all the way from mistletoe, watermelon seeds, and garlic, down to the sulfacyanates, and now she has had deep x-ray therapy on two separate courses.

Results: None. There has been no appreciable change in either the blood pressure or the symptoms. No change in the eyegrounds before or after treatment. At the present time she is taking absolutely nothing at all. She is still hopeful that someone will find some cure for her before she gets too old to take it.

Case No. 2. White female, age 52. Chief complaint: Vertigo, severe headaches and blurring of

vision. Patient had been suffering from hypertension for over ten years, she stated. When first seen she definitely had cerebral symptoms. Her blood pressure was 260/130. Electrocardiogram did not demonstrate any coronary disease but definite ventricular hypertrophy. The eyeground changes were severe, Group 4.

Treatment: She was given one course of deep x-ray therapy to the adrenals. This she tolerated very well. Little change was noted in the blood pressure but the patient did improve somewhat clinically; she continued at a status quo for a period of four months when one afternoon while cooking a pie in her kitchen at home she staggered and fell. She was brought into the hospital unconscious and never regained consciousness. She lived five days, during which time she never moved her right arm or leg. No autopsy was obtained, but I am sure she died of cerebral hemorrhage. It is interesting to note how well the heart stands up under such terrific pressure in these cases of essential hypertension.

IV. SECONDARY HYPERTENSIONS

Vascular reactions occurring from secondary factors, such as nephritis, Goldblatt kidney (atrophic kidney), Buerger's disease (thrombo-angiitis obliterans), hyperactive adrenals (adrenal medullary tumors), hyperactive carotid sinus, allergy and coarctation of the aorta.

Case No. 1. White male, age 32, a young German Jew. Chief complaint: Buerger's disease. He was thoroughly worked-up at the University of Minnesota and told to come south so he could get well in the warm climate. His chief symptoms when I first saw him were severe angina like pains in the pericardium exaggerated on the slightest exertion and radiating down the left arm. Marked painful swelling of the right lower leg from the knee down; pain in the left leg, and coldness of the feet. He stated that he was unable to walk any distance because of the pain in his legs and chest.

Examination: Blood pressure 122/180; head negative, heart and lungs were normal; abdomen negative; extremities—the lower legs were slightly swollen and the right more so, painful on pressure, numerous small dark brown areas noted. The feet were extremely cold to the touch.

Laboratory and electrocardiographic examinations were essentially negative. He had been told that he had coronary changes. I sent for his records and could not see any evidence of these on the tracings. They did note the effect of tobacco on this case while they had him under treatment.

Treatment: One course of deep x-ray to the adrenals (six treatments) was given. Edema of the right ankle disappeared after the second treatment with relief of pain. No change in the blood pressure was noted. Six months after treatment he remains completely clear of all symptoms. I put him through very vigorous exercises and he did not have the least difficulty. He passed through the winter without the least discomfort with his legs. The only restriction now is he is not to use tobacco, the avoidance of which I am sure has been of help in his recovery.

CONCLUSION

The cases treated and classified as described above were divided as follows:

1. Vascular Hyperreactive
2. Latent Hypertension (arteriosclerosis)
3. Essential Hypertension (diffuse vascular disease)
4. Secondary Hypertensions

Those cases falling under Class I, Vascular Hyperreactive; Class II, Latent Hypertension, and Class IV, Secondary Hypertension, responded most favorably to treatment. Of these, the most satisfactory response was in Class I first, Class IV second, and Class II third. Little or no response was obtained in the Diffuse Vascular Disease, Class III. The most striking relief was in the patients having angina pain. In every case they were relieved of pain for long period of time or permanently, wherein lies the value of this form of therapy allowing these people to resume a normal life. Its value in preventing Class I from going into Class II is yet undetermined; that will require years of follow-up, which we will attempt to do, the Lord be willing.

* * * *

NOTE: An additional 12 cases have been treated since the presentation of this report. Of these, 8 were in Group I, 3 were postcoronary anginas, and 1 was a case of Buerger's disease. There has been complete alleviation of symptoms in all 12 cases.

In the case of Buerger's disease presented in this paper, follow-up reveals that the patient is now able to take extended hikes of anywhere from two to five miles without any evidence of claudication.

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SPONTANEOUS PERIRENAL HEMATOMA

TWO CASE REPORTS

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ALEXANDRIA

Patients with spontaneous perirenal hematomas present themselves with varying complaints and oftentimes their symptoms are such that the urologist does not see them initially. Many have marked peritoneal irritation with signs and symptoms of intra-abdominal pathology so that exploratory laparotomies are frequently done. Two patients with this condition have been seen on our service recently and the correct diagnosis was not made preoperatively in either case.

CASE REPORTS

Case No. 1: J. B., colored female, age 47 years, was seen January 4, 1948 with a chief complaint of pain in the right lower abdomen. Her present illness began rather suddenly four days previously when she noticed moderately severe pain over the right side of the abdomen, constant and nonradiating. This was associated with nausea and vomiting, rather marked weakness, high fever, and chills. There had been no trauma of any kind to her abdomen or back. She had noticed mild frequency of urination and nocturia. Her urine looked cloudy the day of onset but she denied having had hematuria or dysuria. She had never passed any urinary stones. Her bowel habits were unchanged. The pain had persisted, but had become more localized to the right lower abdomen and she also noticed mild pain over the right costovertebral angle. Her local physician had given her sulfadiazine which had helped the fever and chills but had no effect on the pain.

Past medical history revealed that an appendectomy had been done twenty years previously. She received treatment for syphilis in 1944. In the same year, she had a hysterectomy done in this hospital for a large fibroid tumor. The surgeon was afraid he might have injured one of the ureters, so the following day she was cystoscoped and catheters were passed to the kidney pelves with ease. However, a 70 cc. stasis of hazy urine was found on the right side and an excretory urogram done the same day failed to visualize the right pelvis and calices. The left kidney was normal. A diagnosis of old right hydronephrosis, cause undetermined, was made and she was referred to the Urology Clinic but was never seen there.

On physical examination, the right side of the abdomen was moderately tender, worse over the lower right quadrant, and there was slight rigidity. No definite mass could be palpated but a feeling of resistance was noticed in the right lumbar region. There was also mild tenderness over the right costovertebral angle. No rebound tenderness was present. Pelvic examination revealed an old inflammatory mass in the right adnexa. Rectal examination was negative.

Urinalysis revealed a few pus cells; urine cultures from the bladder and right kidney were reported positive for *Escherichia coli;* and the urine culture from the left kidney pelvis was negative. Red blood cell count was 3.7 million; the white count was 17,450 with 85 per cent polymorphonuclear leukocytes. Total two hour phenolsulphonphthalein excretion was 65 per cent and the blood urea nitrogen was 18.6 mg. per cent.

Cystoscopy revealed a normal bladder. A catheter could not be passed more than 20 cm. up the right ureter and practically no urine was obtained. Indigocarmin failed to appear on this side. Retrograde pyelogram showed a large mass on the right side extending from the diaphragm down to the level of the iliac crest. There was marked compression of the pelvis and compression with elongation of all the calices (Figure 1). The upper right ureter was displaced medially to the midline. The findings on the left side were entirely normal. Chest plate showed the lung fields to be clear but there was moderate elevation of the right leaf of the diaphragm (Figure 2).

A preoperative diagnosis of right renal tumor with pyelonephritis was made, and on the third

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Fig. 1. Retrograde pyelogram showing a large soft tissue shadow on right side with marked compression and elongation of the right calices.

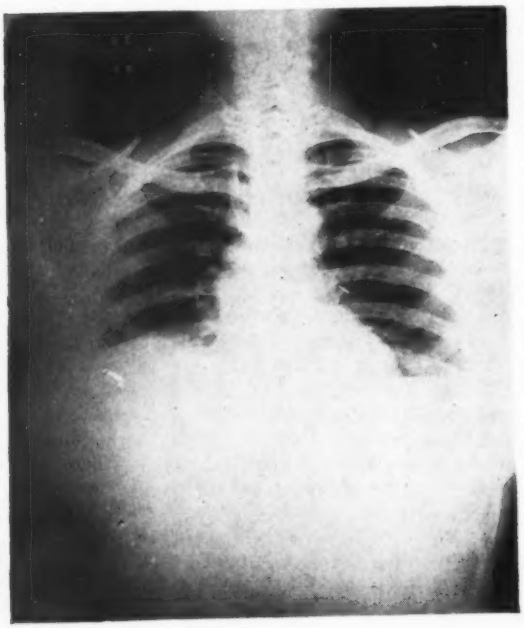

Fig. 2. Erect chest plate showing rather marked elevation of the right leaf of the diaphragm.

day after admission a nephrectomy was done without difficulty through a transverse lumbar incision. It was found at operation that the mass was a huge subcapsular hematoma. Careful examination of the specimen showed that the bleeding had occurred from a small crater in the cortex of the lower pole of the kidney. There was also moderate hydronephrosis, the exact cause of which could not be demonstrated.

Pathological Diagnosis: "Extensive subcapsular hematoma with beginning organization and containing numerous neutrophiles. Hydronephrosis and chronic pyelonephritis".

The patient had an uneventful recovery and was discharged on the eleventh postoperative day.

Case No. 2: C. E., 60 year old white male, was admitted to the medical service on April 26, 1948, because of pain in the right upper abdomen and right costovertebral angle, associated with high fever. Onset of the symptoms had been five days previously. The patient also had diabetes mellitus and he had been taking digitalis for heart disease for four years. His urinary habits were normal and there was no past history of urinary diseases.

Physical examination revealed some moist rales in the right lung base. There was moderate tenderness over the right upper abdomen and right costovertebral angle. No definite masses were felt and there was no rigidity.

Urinalysis revealed 3 plus sugar, 1 plus albumin, and microscopic examination showed many pus cells. Stained urinary sediment showed Gram negative rods and Gram positive cocci; urine culture was reported positive for *Aerobactor aerogenes*. Blood urea nitrogen was 18 mg. per cent. The white blood cell count was 14,150; hematocrit was 42 and there were 12 grams of hemoglobin.

The patient's temperature remained 101-102°F. The day following admission he began complaining of severe right lumbar pain which required opiates for relief. A few hours later it was noted that a mass was developing in the right lumbar region which was very tender. Chest plate at this time showed marked elevation of the right leaf of the diaphragm (Figure 3). Upon cystoscopy and ureteral catheterization, 15 cc. of cloudy residual urine were found in the right kidney pelvis. Indigocarmin appeared faintly on this side after fifteen minutes; it was excreted from the left kidney in good concentration after three minutes. Retrograde pyelograms showed right hydronephrosis with distortion of the caliceal pattern. The right psoas shadow was obliterated by a large soft tissue shadow. A right lateral film revealed marked anterior displacement of this kidney. The left kidney appeared to be entirely normal (Figure 4). By this time the patient had developed some right psoas tenderness.

A diagnosis of right hydronephrosis, pyelonephritis, and perinephritic abscess was made and

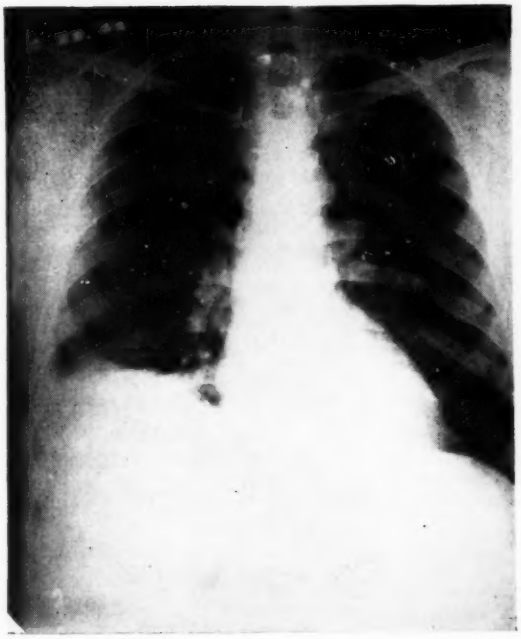

Fig. 3. Erect chest plate of Case II showing marked elevation of the right leaf of the diaphragm.

Fig. 4. Retrograde pyelogram of Case II showing marked distortion and displacement of the right kidney.

the patient was carried to the operating room immediately. However, upon opening the right lumbodorsal fascia, a large right perirenal hematoma was encountered which was recent enough not to be organized. The renal capsule was completely separated from the kidney and was intimately adhered to a thick inflammatory rind of long standing. Some of the hematoma was adhered to a granular area on the surface of the kidney parenchyma. A nephrectomy was done and the patient made an uneventful recovery, being discharged two weeks later.

The pathological diagnosis was: "Kidney with dilatation of calices, hyaline arteriosclerosis and fibrinopurulent pericapsular exudate. Small abscesses present in the surrounding adipose tissue."

DISCUSSION

The earliest mention made of spontaneous perirenal hematoma was in about 1616 by Ballonius in his Opera Omnica Medica. In 1933, Polkey and Vznalck made a complete review of the literature on this subject and found approximately 200 cases reported. However, only in 178 cases was there sufficient information given to be included in this study. Since 1933 the author found nine papers on spontaneous perirenal hematoma in the literature (English language) and these added a total of 14 cases.

Etiologically these cases may be classified in three groups: (1) Diseases of the renal parenchyma and smaller blood vessels such as neoplasms, tuberculosis, pyelonephritis, polycystic disease, hydronephrosis, nephrolithiasis, anemic infarcts, and periarteritis nodosa; (2) extrarenal retroperitoneal causes such as aneurisms of abdominal aorta, renal or spermatic arteries, or hemorrhage from the adrenal vessels; (3) hematoma associated with blood dyscrasias such as hemophilia, thrombopenic purpura and polycythemia.

The youngest case reported was 6 days old and the oldest was 89 years of age; 40 per cent occur between 30 and 50 years of age. Males are more commonly affected than females. Approximately 18 per cent of the hematomas are subcapsular (as in case 1 reported here); the subcapsular type usually results from some pathology of the renal parenchyma as listed in group (1) above.

The signs and symptoms will vary con-

siderably and will depend upon the amount of hemorrhage and the underlying pathology. In the acute cases there is sudden pain of great severity over the abdomen, worse on the affected side, and greatest in the lumbar region. The picture is that of an acute surgical abdomen with internal hemorrhage. There is evidence of shock such as pallor, rapid thready pulse, restlessness, air hunger, fall in blood pressure and marked anemia. A mass may appear in the lumbar region within a few hours and this is the sign most suggestive of the true diagnosis. In the less acute and chronic cases the onset is more insidious; pain is present, but not so severe, and may be described as a feeling of weight or fullness in the lumbar region. Signs and symptoms of hemorrhage are much less severe or absent. The temperature may be moderately elevated from absorption of the extravasated blood or from secondary infection. In some chronic cases the onset is unobserved and may be tolerated for many years and be a surprise finding at the operating table or at autopsy. Roentgenograms usually reveal a large soft tissue shadow in the kidney region and the pyelogram shows compression of the kidney pelvis and calices similar to that seen in large intrinsic renal tumors. In the larger hematomas, elevation of the diaphragm on that side is present; this was an interesting point in both cases presented here. Urinalysis is usually of no help in making a diagnosis of spontaneous perirenal hematoma.

Diagnosis is difficult preoperatively, but may be made if one keeps in mind these points: Sudden pain in the abdomen and lumbar region, signs and symptoms of internal bleeding, mass in the lumbar region on the affected side, pyelographic evidence of compression of the kidney pelvis and calices, and oftentimes elevation of the diaphragm on the same side.

All writers on this subject agree that surgical treatment is the treatment of choice; nephrectomy is indicated in most instances. A review of the cases reported shows that in those receiving no surgical treatment the mortality is nearly 100 per cent; in those cases in which simple drainage and tamponage was done the mortality was 40 per cent; and in those cases that were nephrectomized the mortality was only 22 per cent.

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THORACO-ABDOMINAL INJURIES*

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This presentation will be a brief discussion of the principal factors that caused a decrease in the mortality of thoraco-abdominal wounds during World War II.

Information is derived from association with members of a surgical group and subsequent assistance in the review of 903 thoraco-abdominal injuries, as well as from personal observation, and experience.

Thoraco-abdominal injury is defined as that injury produced by one force or missile which involves the diaphragm, chest, and abdominal cavity. The diaphragm is always injured, and involvement or penetration of the chest and abdomen must be by the same force or missile in order to be a true thoraco-abdominal injury. Theoretically, these injuries may be open or closed. The closed type is relatively rare and of little importance when compared

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with the open type. When the closed type does occur, it is usually associated with crushing wounds of great severity, which result in rupture of the diaphragm with concomitant injuries of the chest and abdominal viscera. The open type is that which is so often seen in war and is the type that will be discussed principally in this presentation. The importance of this type of war wound cannot be over-estimated because approximately 25 per cent of all abdominal wounds are thoraco-abdominal. The advance made during the past war in the treatment of these casualties has been marked, with reduction of mortality from 50 or 60 per cent to approximately 25 per cent. This decrease in mortality has been due chiefly to the following factors:

1. Improved treatment of shock, and preoperative restoration of disturbed cardiorespiratory physiology.
2. Improvement in anesthesia.
3. Improvement in surgical judgment and technic with more utilization of the transthoracic approach.
4. Improvement in postoperative care with special emphasis on keeping the injured lung expanded out to the thoracic wall, and maintenance of a clear air-way.

TREATMENT OF SHOCK

There are three main causative factors in the shock of thoraco-abdominal injuries. These are hemorrhage, deranged cardiorespiratory, physiology, and contamination of the peritoneum and pleura. These factors are usually present to varying degrees; however, severe contamination is usually limited to extensive injuries of a hollow viscus, which may or may not be associated with a severe injury of the diaphragm and pleural involvement.

Treatment to combat shock, in the form of occlusive dressings to the sucking wounds and plasma, is started as soon as the patient is seen by a medical corpsman. The medical corps realized the great importance of early and complete replacement therapy in shock. This realization led to the placement of adequate supplies of plasma and blood for treatment of shock available a relatively short distance from the point of wounding. This is a most important factor in salvaging the severely wounded because the longer a patient remains in shock the less are his chances to come out of it; and, should he respond, the more likely he is to develop anuria during the postoperative course.

Practically all wounded patients receive morphine. Actually, the majority of them receive too much along the chain of evacuation, only to have its maximum absorption after the patient has been partially brought out of shock with deleterious effects. This is mentioned at this point because it is very difficult to clear the tracheobronchial tree and prepare for surgery a patient who has a depressed respiration from an overdose of morphine. This can be remedied partially by giving deep intramuscular injections, which should be carefully recorded each time by corpsmen. Subsequent doses in the hospital should be given intravenously if indicated.

Replacement therapy is continued in the first priority hospital with plasma which is started while blood is being matched. Practically all thoraco-abdominal wounds have to have blood replaced preoperatively, some in large quantities. However, as a word of caution, it should be remembered that in patients with disturbed chest physiology, ability to stand large quantities of fluid is reduced and these patients should not be given too much, too rapidly.

Deranged cardiorespiratory function is due to loss of functional alveoli for aeration and mediastinal shift. Loss of available functional alveoli results from compression by blood and air in the pleural cavity, pulmonary hematoma, and obstruction of the tracheobronchial tree by blood and mucus. This is combated by thoracentesis, which may be repeated at intervals if necessary; and, if the patient shows signs of bronchopleural fistula, a catheter may be inserted into one of the upper intercostal spaces and connected to a water-trap. Tracheobronchial obstruction is treated by intercostal nerve block to relieve pain so as to produce a more effective cough and tracheobron-

chial catheter aspirations. Improvement in the cardiorespiratory embarrassment of some of these patients following tracheobronchial aspiration stamps this procedure as a great aid in preparing these patients for surgery. In many instances there is considerable dilatation of the stomach, with respiratory embarrassment, even if the intra-abdominal injury is minimal. It is mandatory that all thoraco-abdominal injuries should have preoperative decompression of the stomach so as to help respiratory distress and prevent aspiration of vomitus during anesthesia. Most of these patients suffer from insufficient oxygenation of the tissues; so oxygen is given to increase the amount of oxygen available to those alveoli that are functioning. It is usually started on admission and continued during the postoperative phase as indicated.

The main method to combat massive contamination of the peritoneum and pleura is by early operation. Massive contamination of the peritoneum and pleura is very shocking, and often these patients will continue to show a rapid pulse and low blood pressure, even after replacement therapy and cardiorespiratory equilibrium have been restored. In any thoraco-abdominal injury in which there is perforation of an abdominal viscus with contamination of the peritoneum, and in many instances the pleura, it is considered best to operate as soon as the condition of the patient permits, or at a time when the maximum point of improvement has been reached.

ANESTHESIA

It is generally agreed that endotracheal anesthesia given by a qualified anesthetist is one of the greatest factors in the reduction of mortality in thoraco-abdominal wounds. The anesthetist plays an important role for, in addition to putting the patient to sleep, he relieves the surgeon of responsibilities by directing the treatment of shock and keeping a clear airway at all times. He may also assist the surgeon in preoperative and postoperative care by intercostal nerve blocks, intratracheal aspirations, and bronchoscopy.

In many instances, these patients show considerable improvement following intubation, aspiration, and administration of oxygen-ether by the closed method. During the operation, the lung is expanded periodically and allowed to collapse to facilitate exposure. At the close of the operation, the lung is re-expanded. If it fails to expand satisfactorily, intratracheal aspiration or bronchoscopy is performed.

The most generally used and most satisfactory anesthesia is an induction by nitrous oxide-oxygen with maintenance by ether-oxygen in a closed carbon dioxide absorption system. For those who used the Beecher portable machine, induction seemed to be carried out more satisfactorily and safely by open drop ether.

Preoperative medications most often consisted of atropine gr. 1/150 or gr. 1/100. Since most patients receive adequate, or too much morphine before admission to the hospital, this drug is given only occasionally, and then by vein.

APPROACH AND TECHNIC

Before selecting the approach that is to be used, an estimation of the expected intrathoracic and intra-abdominal injury should be made. It has been definitely shown that the transthoracic approach has helped to decrease the mortality of thoraco-abdominal injuries and it should be used whenever possible and circumstances permit. If a celiotomy is also necessary, it is paramount to perform a thoracotomy first, and then proceed with the celiotomy after the cardiorespiratory equillibrium has been restored. Advantages of a primary transthoracic approach are briefly as follows: (1) It allows an early and direct attack on the chest pathology with efficient repair and correction of deranged cardiorespiratory physiology. Infection of the pleura may be reduced by irrigation and lavage of contaminated cases. (2) Certain upper abdominal organs can be more easily cared for and this may be accomplished under a lighter plane of anesthesia because abdominal relaxation is not necessary. Splenectomy and repair of injuries in the cardiac region of the stomach are more easily handled through this approach than any other. A colostomy may be performed with the

colostomy opening more distal from the incision than would be possible if an abdominal incision were made. (3) The diaphragm can be repaired more easily and effectively from above. (4) The postoperative course is smoother and there is less pain than usually is found in cases in which the abdominal incision has been used. Also, the patient may become ambulatory sooner and may be moved sooner.

It is my belief that there is no indication for primary celiotomy in thoraco-abdominal wounds when adequate anesthesia and facilities are available. The diaphragm should be repaired first and from above in practically all instances. The early correction of chest physiology by closure of the diaphragm and chest wall following removal of blood clots and re-expansion of the lung before performing other procedures is a principle which has caused little or no controversy. Nevertheless, there are some who believe lower lateral lesions, even on the right, should be attacked primarily from the abdomen. Even if the lesion is low down in the costophrenic sinus region, it is better first to repair the diaphragm and chest wall and re-expand the lung by aspiration of blood and air from the pleural cavity. This can be accomplished by debriding and enlarging the wound of entry and grasping the opening in the diaphragm with Allis forceps. It then can be sutured easily and dropped back in position. If the abdomen is opened first, a sucking wound is produced, and this may be more serious than is expected. Closure is likely to be very difficult through the usual type of abdominal incision in this type of injury, and abdominal manipulation may cause more contamination of the pleura by bowel contents being sucked into the pleural cavity. How much can and should be done through the diaphragm depends on several factors. For anatomic reasons, exploration on the right side is limited to the liver, right kidney, hepatic flexure of the colon, and, in some instances, the duodenum. On the left side, most of the remaining organs can be explored, with the exception of the lower ileum, ascending colon, and almost all of the descending colon. The main factors that cause abandonment of surgery started through the diaphragm are: (1) Poor condition of the patient, and (2) possibility of severe contamination of the pleura. Usually, when there is extensive colon damage or small bowel damage that necessitates resection, it is wiser to close the diaphragm and chest after controlling hemorrhage and proceed through an abdominal incision. The condition of these patients always improves following control of gross hemorrhage, closure of the diaphragm and chest with expansion of the lung. In handling colon wounds through the diaphragm, it is a good policy to close the openings hurriedly as soon as they are found. This prevents further gross contamination of the peritoneum and pleura while colostomy (exteriorization) is being performed.

Incision: In order to have adequate exposure, the thoracotomy incision should be between the eighth and tenth ribs. If the wound is in this area, it may be debrided thoroughly and extended. A rib may be resected; however, the intercostal space with two rib spreaders gives just as good exposure. There seems to be no indication for the combined incision across the costal arch. Closure of the incision is performed in order to secure a permanent air-tight closure and one that is least likely to become infected and break down. A thorough debridement and an anatomic layer closure without too much tension is the best prophylaxis against a breakdown of the incision or wound. When the defect is large, adjoining muscle flaps should be utilized freely to secure an adequate closure. There seem to be no deleterious effects in closing the skin to secure a good closure in those areas where there is sparse musculature.

Drainage: It is safer to use at least one intercostal tube connected to a water-trap. As a rule, it is inserted in an upper anterior interspace, usually the second in the midclavicular line. It facilitates expansion of the upper lobe and takes care of transient bronchopleural fistulae.

A second catheter is frequently used in

cases where there is considerable lung damage and contamination. It drains fluids or pus that may collect and also acts as a check valve against bronchopleural fistulae.

Drainage catheters should never be brought out through an incision or wound.

Diaphragm: It must be realized that thoraco-abdominal injuries always involve two spaces and, in many instances, a third. The pleural and peritoneal cavities are always involved and, in many cases, the retroperitoneal space. The surgeon's aim should be to separate these spaces as in their normal state and use surgical repair and procedure that will allow them to remain separated during the postoperative course.

Many of the complications, such as subphrenic abscess and bile empyema, can be prevented if the diaphragm is repaired efficiently and the associated liver wound adequately drained. These complications were rather frequent early in the war but showed a marked decrease with experience and attention to the above points.

In order to make a good repair the diaphragm should be sutured from above; on the right side, it is almost imperative to work from this approach. Suture material should be silk or cotton, and a two layer closure should be performed if time and the patient's condition permit. Crushing the phrenic nerve is not necessary and, in all probability, does more harm than good when performed. It is difficult to conceive how a patient can aerate the involved side, cough, and clear the bronchial tree in the presence of diaphragmatic paralysis.

Subcostal drainage of liver wounds should be through an adequate opening, and at least two drains should be used in order to obtain more suitable drainage. A subcostal incision, 1½ to 2 inches in length, should be made and not a "stab wound" which may vary greatly in size and efficiency. If the wound perforates the liver, drains should be placed above and below the liver and brought out together. When drainage of the subphrenic space is adequate, no collection occurs which may strain or break through the repaired diaphragm. On the left side, breakdown of a repair may be more serious, and acute herniation of the stomach and bowel into the left pleural cavity may result in a patient already critically ill.

The retroperitoneal (perirenal) area should be drained laterally and posteriorly in kidney wounds if nephrectomy is not indicated. If possible, the retroperitoneal space should be separated from the peritoneal cavity by suture. Here again adequate drainage is important. If the kidney is damaged considerably, there may be continued drainage of blood and urine which will follow the course of least resistance.

POSTOPERATIVE CARE

Immediate postoperative care is directed to the treatment of postoperative shock. Here again, the importance of shock is realized when it is found to be the most frequent cause of death on the operative day, and on the first and second postoperative days. Replacement therapy is continued and is gauged by hematocrit and plasma protein determinations when the facilities are available. In general, the care of these cases is directed toward the treatment of both the chest and abdominal conditions.

Since the most frequent complications are found in the chest and it is probable that more patients with chest injuries die from poor postoperative care than poor surgery—emphasis should be directed to the handling of the chest postoperatively. It is improvement in this factor that apparently has led to a decreased mortality.

By maintaining cardiorespiratory equilibrium in the postoperative phase, these patients are assisted greatly in recovering from postoperative shock and, in addition, complications are reduced to a minimum. This is accomplished by maintaining a clear airway and by keeping the lung expanded out of the chest wall. It is begun at the close of the operation when the anesthetist aspirates the tracheobronchial tree and bronchoscopes the patient if necessary.

After the patient is taken to the ward, a clear airway is maintained by judicious sedation, an effective cough, which is facilitated by intercostal nerve block when indicated for pain, tracheobronchial aspira-

tion, and bronchoscopy, if necessary.

Tracheobronchial aspiration is a very simple and effective procedure. Blood, mucus, and later, pus may be aspirated, and in the patient who cannot cough or expectorate efficiently, it is of great aid in clearing the tracheobronchial tree and preventing postoperative atelectasis and pneumonia. The lung is kept expanded by repeated aspirations and careful periodic checks of the intercostal water-trap. One tube placed in an upper interspace usually will facilitate expansion of the upper lung field and can be removed on the second or third postoperative day. If no drainage or no low posterolateral tube has been used, the chest should be aspirated daily until the pleura is dry and the lung expanded. The occasional development of a bronchopleural fistula necessitates the insertion of an intercostal catheter connected to a water-trap. By keeping the lung expanded, especially the upper lobe, the incidence of empyema is decreased; and, if it does happen to develop, it is localized in the lower chest where it is relatively easy to treat.

Nasogastric suction is used in all cases in which there is a perforated hollow viscus or ileus, and it is maintained until peristalsis is re-established satisfactorily. This decompression of the stomach and intestine also contributes toward deep respiration and a more effective cough with resulting clearing of the air passages. There is no set time limit for upper abdominal decompression, but it should not be used without reason beyond four to five days because of the possibility of masking a bowel obstruction.

Since kidney complications with oliguria and anuria are rather frequent, a careful check of intake and output is made during the postoperative course. The amount of fluids given by vein is gauged by the output. Precautions should be taken against overloading the pulmonary circulation. Saline should be given cautiously in all cases because of possible impaired renal function and the tendency to development of pulmonary edema in patients with disturbed cardiorespiratory physiology.

Penicillin and sulfonamide therapy undoubtedly have played a big part in the reduction of complications and mortality of thoroco-abdominal injuries by prevention and control of infection. It is impossible to estimate to what extent the decrease in mortality has been due to these drugs; "nevertheless, without proof, it is considered that this reduction in mortality is a reflection, more likely, of a greater knowledge and experience in dealing with the problem of the thoraco-abdominal wound as a whole, a greater appreciation of the thoracic implications and complications, a greater experience and facility of the individual surgeon and anesthetist in the operative treatment, and, lastly, a keener appreciation and attention to details of preoperative and postoperative care".[2]

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SUBTALOID DISLOCATION OF THE FOOT; CASE REPORT OF THE OUTWARD TYPE

CHARLES V. HATCHETTE, M. D.
LAKE CHARLES

Subtaloid dislocation of the foot is a relatively rare injury, usually resulting from a fall which causes torsion of the foot. The talus remains in the ankle mortice when the foot is torn loose at the subtalar and talonavicular joints. The dislocation may be inward, outward, forward, or backward, the displacement being dependent upon the direction of force causing the injury. There is complete or severe tearing of the lateral ligaments of the ankle joint and quite frequently an associated fracture of the talus. Successful treatment of this unusual condition presents a real challenge to the ingenuity of the attending physician. It is the purpose of this paper to present a case of the outward type and to discuss this rare condition.

CASE REPORT

I. C., age 19 years, white male, was first seen on August 9, 1947, complaining of severe pain and deformity of the right foot. The background of his

medical and surgical history was without significance. He stated that on August 8, 1947, the ladder on which he was standing slipped, causing him to fall to the concrete sidewalk below.

He did not remember whether he jumped as the ladder began falling, or whether he came down with the ladder, but believes the right foot struck the curbing of the sidewalk. All the weight of his body came down on the right foot. The injury was extremely painful and he could not rise from the fallen position. His fellow workers assisted him to a standing position and he then noticed that the right foot was deformed with a shift to the outside. An ambulance was called and he was admitted to the local hospital within fifteen minutes of the accident. His family physician arrived in approximately thirty minutes and, at that time, a hypodermic injection of morphine was given. Some relief was obtained from the morphia, but the patient noticed that the foot was considerably swollen with "cramping up" of the toes and a bluish discoloration on the medial aspect just below the ankle. A general anesthetic was given and an attempt made by the doctor to reduce the deformity. This was unsuccessful, for the patient awakened a few hours later to find the foot still very painful and deformed. No plaster was put on the extremity, but a posterior right angle splint was applied to the foot, ankle and lower leg. Morphine was given at regular intervals during the night and the next day for pain. At 5 p.m. on August 9, 1947, he was referred to the writer. A roentgenologic examination was made which showed a subtaloid dislocation of the right foot with complete lateral dislocation of the calcaneus, navicular, and remaining bones of the foot. There was a

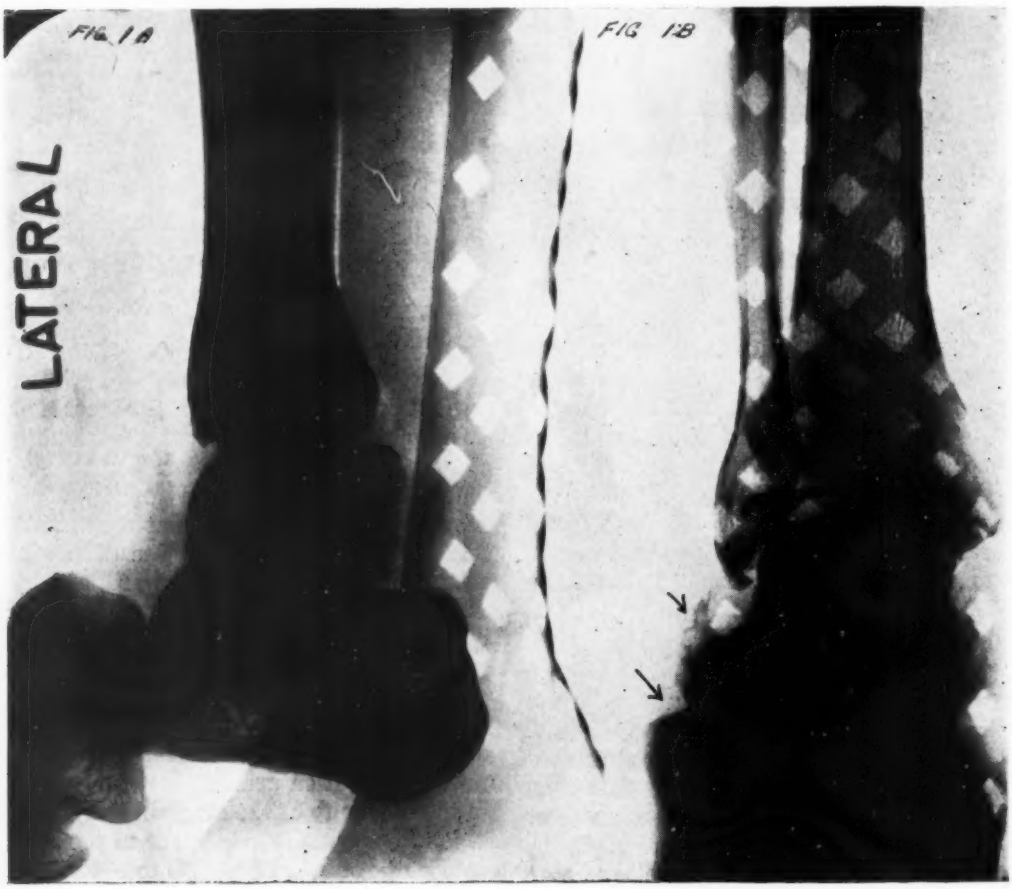

Fig. 1. (a) Lateral view of right foot in which talus is rotated forward and downward. (b) The complete lateral displacement of the foot from an AP view.

sharp downward rotation of the talus with probable rupture of the medial and lateral talocalcaneal ligaments.

At 8 p.m., he was given sodium pentothal intravenously and an attempt was made to reduce the deformity. It was found that the bones were immovable under attempted manipulation. Open reduction was scheduled at 8 a.m. the next morning. Under general anesthesia, a Steinman pin was driven through the os calcis, a medial incision was made at the inferior border of the talus extending from the navicular approximately three inches. Through the incision a lever was inserted between the os calcis and the talus and, with traction by the assistant on the Steinman pin, strong leverage was used to rotate the talus upward and force the os calcis medialward. A loud cracking sound attended the sudden reduction. The bones of the foot were then moulded manually into their normal positions. The incision was closed with plain O catgut and a plaster cast applied from midthigh to the toes with the knee in moderate flexion.

The postoperative care consisted of morphine, gr. 1/4, every hour to eight hours as necessary for pain, and 50,000 units of penicillin every three hours as an aid in preventing infection. Fever

Fig. 2. The completed reduction. The Steinman pin in the os calcis was used for traction purposes.

was of the "saw tooth" variety, ranging from 100°F. to 102°. for a period of about seven days. It then subsided to normal. Two weeks following operation, the cast was taken off and sutures were removed. The swelling had subsided entirely and the foot was approximately normal in appearance; there remained some residual discoloration on the medial side of the foot beneath the malleolus. The cast from midthigh to toes was immediately reapplied and the patient allowed to return to his home with instructions to return in two months.

He was told to report to his family physician if

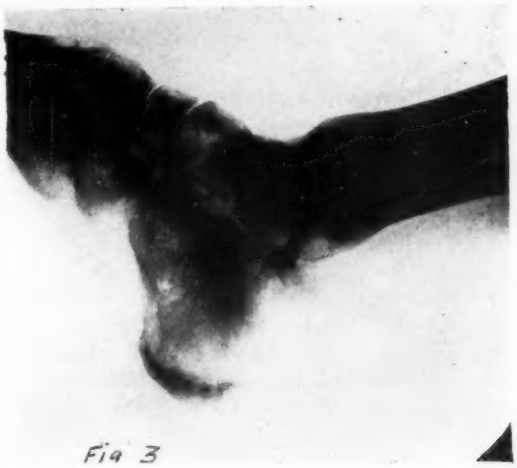

Fig. 3. Right foot and maintenance of position of the carpals after several months.

anything arose that he did not understand. The patient apparently had no difficulty, for in subsequent discussion of the case with his physician it was determined that the patient did not contact him. The patient again reported to the writer on October 6th and, on that date, the cast was removed and another X-ray examination made. Excellent anatomical position of the bones was shown to have been maintained, but traumatic arthritic changes of moderate degree were beginning to appear between the astragalus and the calcaneus, and between the astragalus and fibula. No support of any kind was applied to the lower extremity following this examination, but the patient was given instructions to move the knee and ankle as much as possible up to the point of pain and was advised to return for reexamination in one week. Weight bearing to painful limits was allowed and encouraged. One week later, 3/16 inch Thomas heels and main arch supports were used as corrections on the shoes. This gave so much comfort that the patient requested that he be allowed to return to work. Light duty was allowed with gradual resumption of arduous tasks and prolonged weight bearing. On November 15, the pain had subsided to a considerable degree and motions of the foot were practically normal. A very slight limp was noticeable and permanent disability of the right foot was estimated to be approximately 5 to 10 per cent. The patient has not returned since that date, but it has been learned that he is working at his normal duties of theatre attendant without apparent discomfort.

DISCUSSION

The first recorded case of subtalar dislocation was reported by W. Hey[5] of London, England, in 1810. Several references were made to this type of injury in later reports but it remained for Broca,[2] in 1852, to properly analyze reported cases and give the name "subastragaloid" to the dislocation. He demonstrated in his paper that the talus remained in the ankle mortice and the calcaneus and navicular, together with other bones of the foot, were displaced. Broca coined the terminology applicable to the different types of dislocation and classified them according to the position of the foot rather than the position of the astragalus. The terminology has not been changed and is used today in describing the various types of subtalar dislocations. Shands[11] reported a series of cases in 1928, and in 1942, Wise[14] found 10 cases reported in the literature written between 1928 and 1942. Of these, 7 were of the inward type, and 3 were of the outward type. Shands,[11] in a study of 138 cases reported before 1927, points out that the outward displacement of the foot is exceptional.

PATHOLOGY

In the inward type dislocations, a complete separation is found of the navicular from the head of the talus. The talus lies on the lateral side of the foot and on the superior surface of the cuboid. The cruciate crural ligament is beneath the head of the talus and the extensor tendons are medial to it. Ligamentous damage is extensive with rupture or severe tearing of the dorsal talonavicular, talocalcaneal, the interosseous, and anterior and lateral talocalcaneal, and the anterior talofibular ligaments. The os calcis is displaced inward. Severe tearing of the interosseous talocalcaneal ligament necessarily results in the production of the dislocation. In the outward type there is also extensive ligamentous rupture with the navicular, os calcis, and other bones of the foot displaced outward. The superior articular surface of the talus remains within the ankle mortice and the head of the talus lies on the medial side of the foot in relation to the inner surface of the navicular. In the backward type the os calcis with the navicular and other bones of the foot is displaced backward with the head of the talus resting upon the superior surface of the navicular. In the forward type, the os calcis with the other bones of the foot is displaced forward and the head of the talus rests upon the superior surface of the os calcis.

TREATMENT

The urgency of immediate reduction cannot be overestimated because of danger of sloughing of the soft tissues due to pressure on the deep vessels of the foot. There is obvious deformity of the foot with marked swelling and considerable pain, and reduction should not be delayed in order to obtain a roentgenogram. X-ray examination should be made to confirm diagnosis if it is available but should not be allowed to delay treatment. This is in the nature of an emergency, especially in the presence of circulatory impairment. If the patient is seen within an hour or two of the accident reduction can, as a rule, be accomplished by manipulation with relatively little difficulty. After twenty-four to forty-eight hours have elapsed severe swelling and edema of the foot are such that reduction by manipulation is often impossible. Arthrotomy is indicated when closed reduction is unsuccessful. The incision is made over the prominent talar head either on the medial or lateral sides of the foot, depending upon the type of dislocation that is being treated, and the dislocation is reduced by means of a lever. It is sometimes necessary to divide the tendon of the tibialis posterior, which lies upon the neck of the talus and between it and the navicular, in order to lever the bones into proper position. This is encountered in the outward type of dislocation. The cruciate crural ligament drawn tightly about the head of the talus is a frequent cause of unsuccessful reductions by manipulation but is overcome by strong leverage in open operation. In late unreduced cases, in which treatment has been delayed and there is definite evidence of

degeneration of the articular cartilege, an open reduction with talocalcaneal and talonavicular arthrodesis is the treatment of choice. Compound wounds complicating subtalar dislocations are treated by debridement, reduction, and immobilization. The antibiotics are given freely in controlling contamination and infection. Removal of the talus, formerly practiced in the treatment of such injuries, has been discarded in favor of the more conservative treatment. This procedure should be reserved for badly infected cases or those in which the talus is comminuted badly and beyond repair.

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THE VOLUNTARY FEDERAL HEALTH INSURANCE BILL AND THE NATIONAL HEALTH BILL

Two bills have been recently introduced in the Senate that have a bearing on the problem of state medicine and are of great concern to the medical profession and the public. Senator Hill with others introduced S. 1456, the Voluntary Federal Health Insurance Bill, and Senator Taft with others introduced S. 1581, the National Health Bill.

Both bills are to assist in the problem of providing adequate medical care for all. They are designed to meet a demand in this field without disturbing the doctor-patient relationship and without destroying the independence of the physician, at least at the start. Both, however, are in accordance with the tacit recognition of a new principle in government that the state has to support the citizens rather than the citizens support the state.

The Voluntary Federal Health Insurance Bill, S. 1456

The voluntary federal insurance plan of Senator Hill would contrive to assure hospital and medical care with "grants in aid," to the states on approximately an equal basis. It gives as its purpose, "to make a high quality of hospital and medical care available to all persons in each State by (a) strengthening and coordinating existing health resources within the State, (b) encouraging and stimulating voluntary enrollment in prepayment plans for hospital and medical care, with emphasis on employer participation and on making such protection available to persons in rural areas, and (c) providing protection to persons financially unable to pay all or part of subscription charges for prepayment of hospital and medical care." The author stated in explanation that the bill would perform the same service for financing hospital and medical care that the Hill-Burton Act is now doing in the building of new hospitals. The individual state authority would determine who would be eligible for such assistance. He further stated that our present system had been too valuable, too effective and too useful through the years to throw it aside for a new system that might not work. "You cannot build a tree . . . Our problem is to take our existing system and continue to make it bigger and better."

The bill corresponds to the principles of the 12-point program which have been urged by the AMA for some years. It would, however, tax existing facilities far beyond their present capacity, either as regards availability of hospital beds or pyhsicians. The operation of the provisions of the bill would include perhaps ultimately two thirds of the population. The same forces that are now working for compulsory federal insurance and state medicine would attempt to expand its provisions to include

all. Central authority by withholding grants in aid could exercise great power in directing the affairs of state authority. The opportunity to enforce so-called civil rights and social equality with Negroes would lie in the operations of such a law. The bill was introduced by a Southerner but greater distortions than this have accompanied the workings of many federal laws.

The National Health Bill, S. 1581

The bill introduced by Senator Taft is less inclusive and its operation would be less of a departure from our present system. The bill is broadly similar to S. 545 of the Eightieth Congress which was opposed in principle by organized medicine at that time. The method proposed is also by grants in aid to the states. These would enable the states to gradually expand the services needed, and to the point where they would be adequate and available to all unable to pay for such. The same objections apply to this bill as to that of Senator Hill except that its operation would be slow; ill effects could be seen and perhaps corrected. The authors modestly state they "do not suppose that they or anyone else had produced the final word in national health legislation. They have studied all the major legislative proposals now pending in this field and are conscious of the peculiar merits and effects of each approach. They fully expect that whatever legislation emerges from congressional deliberation on this subject will not embody the doctrine of any particular faction but will combine features of every major proposal. But they are convinced that no legislation is adequate unless it conforms to certain principles which this bill seeks to express. These principles are:

"1. The quest for good health is a many-sided, long-range problem and demands a many-sided, long-range program.

"2. The supply of health facilities and professional personnel must keep pace with the effective demand for health services. If this elementary principle is ignored, a serious lowering of quality is bound to follow.

"3. No Government program should call for expenditures beyond the financial resources of Government, which in turn are limited by the degree of taxation which a free economy can support. Deficit financing merely puts off the day of reckoning and must never be resorted to for a welfare program except in cases of desperate emergency when sufficient funds are not available out of general revenue.

"4. No Government program should include activities or expenditures which can be supported by private individuals and groups or by lower levels of Government. On the contrary, government welfare programs must always be framed in a manner and spirit which will stimulate initiative and creative activity on the part of individuals, private groups, and smaller communities."

Consideration of these two bills by solons who have a conservative attitude toward medicine along with S. 5, the state medicine compulsory insurance bill, brings us as doctors to realize that a clamor is being heard in the halls of government for tax supported medicine. Our product is evidently so good that the public wants more than it can pay for and calls on the government to make up the difference. The same popular feeling could spread to rent, shoes and theaters. We would then duplicate many features of former days of the Roman Empire, and with the same result.

ORGANIZATION SECTION

The Executive Committee dedicates this section to the members of the Louisiana State Medical Society, feeling that a proper discussion of salient issues will contribute to the understanding and fortification of our Society.

An informed profession should be a wise one.

REPORT OF THE PRESIDENT OF THE LOUISIANA STATE MEDICAL SOCIETY

Following is report of the President of the State Society, submitted to the 1949 House of Delegates. This is published because it is felt that the report contains data and recommendations which should be of interest to every member of the organization.

The past year has been one of unusual activity for the entire Society. Whatever we have accomplished has been due to the efforts of various committees and individuals who have given freely of their time. Unfortunately many members of the Society do not realize the extent of our activities or the time and effort put forth by a relatively few to accomplish this work. A greater interest in the various activities of the organization by the membership at large would be most helpful.

Your State Society is in a very healthy condition at the present time. The total membership for 1948 was 1874. Financially we are quite sound which is due largely to the fact that amount of dues was raised to twenty-five dollars several years ago. The added funds from this source have permitted the Society to engage in more activities and to meet various emergencies without having to draw upon reserve funds. It is to be noted, however, that our present income is only sufficient to meet expenses and does not provide any great margin for safety.

We have a number of standing committees, some of which are quite active, but others are very inactive. Some of these committees might be dispensed with and new committees added. A committee on veterans' affairs is needed and in addition there may be others. This subject should be studied during the coming year, either by the Executive Committee or by a special committee authorized by the House of Delegates. It would also seem wise to distribute membership on these committees to include more members. In times past several members have been appointed to three or more committees. True, they have been splendid workers and have given freely of their time, however, the more members we have who are active in the work of the Society the stronger will be our organization. I think the general policy should be adopted of having a man to serve on only one committee. In this way the work will be scattered, drawing more men into the activities of the Society.

You will see from the report of the Louisiana Physicians Service that this company is now in a very sound financial condition. We have weathered the storm of the first few years and should now be able to expand and give greater service to the people of this state. It is particularly gratifying to state that we have reached an agreement with the Hospital Service Association of New Orleans and the Louisiana Hospital Service Association whereby hospital, surgical and partial medical coverage can be offered to the people of the state in one package. This is considered an important step forward. Every part of the state can now be covered; something we have not been able to do heretofore.

These organizations should have the complete and enthusiastic support of the doctors throughout the state. One is a child of your Society and together they constitute our best answer to the proponents of compulsory health insurance. Their success is assured with your complete support. You should be familiar with their set-up, the type of policy offered, its cost and at all times urge your patients to take advantage of this service.

During the past year the Executive Committee has had under consideration the Red Cross Blood Bank plan. At present there is a committee studying this plan and a report from this committee to the House of Delegates is expected at this meeting. It is my opinion that we should lend this plan our support. The Red Cross is conforming to the wishes of the AMA and at the same time offering a service badly needed throughout the state. I doubt that complete and satisfactory service to rural areas can be furnished otherwise. The use of blood is so often necessary, frequently as an emergency procedure and it should be available at all times. This is something that small hospitals can not accomplish without help such as can be supplied by the Red Cross. Certainly this plan should be given every consideration.

Attendance at the special meeting, held in Alexandria on February 20, was very gratifying. The seriousness of the present situation and the need for action by every member of the Society was well presented. I believe that a more unified and intensive support from the entire membership has resulted from that meeting, and it is regrettable that a good many stayed at home apparently unconcerned about the issue.

At the time this report is written the political situation, if one may speak of it in that term, has improved. Several months ago it appeared that some form of compulsory health insurance would certainly be passed by the present Congress. At present this seems doubtful, however the threat still

exists. I am of the opinion that the combined efforts of the medical profession throughout the country and the efforts of others interested in free enterprise have made an impression upon the people and upon Congress. We can not let up in our efforts but must continue to make people, generally, aware of the dangers of any such plan and the need for preserving our independence from government domination of all of our activities.

We should actively support the program of the AMA. This can be done first by contributing twenty-five dollars to carry on the educational campaign. The payment of that fee is a direct obligation which we should gladly assume. Insofar as I know it is the only fee which has been required by the AMA. We are members of the AMA and have enjoyed membership without payment of dues so there should be no squabble about this assessment to be used to preserve a free profession.

Secondly, we should actively support the broad program as outlined by the AMA in its twelve point health plan and should continue to implement the campaign against compulosry health insurance as outlined by Whitaker and Baxter. We cannot relax in this campaign. Everyone who is interested in free enterprise must continue the fight until the tide of public opinion has been definitely swung from this present socialistic trend. It is important for every doctor to be informed on the subject and to be able to present sound argument against compulsory health insurance. Simply shouting socialism, bureaucracy, and so forth, will not help the cause.

Government participation in health programs is here to stay. It is sponsored by both political parties and urged by lay and professional groups. Some of these activities are needed and are most desirable but every effort must be put forth to direct these activities through necessary channels and prevent complete domination of medical education and practice from Washington. Many other groups are feeling this same pressure from Washington and only by the combined effort of all groups opposed to such socialistic trends can we hope to win. We are opposing a trend in thinking or in government which must be met by sound argument and by alternative plans.

One must realize that there are shortcomings in our present system of medical care. There are discrepancies in its availability and the cost is a serious matter for a large portion of our population. The medical profession is not responsible for either of these, however the improvement or correction of the situation is our responsibility. If we accept this responsibility and as a profession make a serious and earnest effort to see that adequate medical care is available to all people at a cost within their reach, then we need not fear political control. However if we go back to a state of complacency, letting things jog along, we probably will not be so fortunate in the political field in future years as we have in the past.

You will note that one of the points in the AMA health plan is to encourage the prompt development of diagnostic facilities, health centers and hospital services, originated for rural and other areas in which the need can be shown and with local administration and control as provided by the national hospital survey and construction act or by suitable private agencies. This covers one of the major needs of our state. Louisiana is primarily a rural state and there are areas in the state which do not have adequate medical care. The State Society should formulate some plan or support some plan which will permit the rural parishes to build hospital facilities under the Hill-Burton Act for the care of private patients. We should also formulate some plan to encourage young doctors to settle in rural communities. This will partially be accomplished by aiding the rural areas in building suitable facilities but we might also consider the plan, now in effect in Mississippi, whereby medical students are subsidized provided they will practice for at least five years in a rural community in the state. Rural health needs more than talk; it needs an active plan for the improvement of present facilities. We should accept this as part of our obligation and be leaders in fostering such a plan.

There should be some overall planning board in the state to study the entire medical care problem and attempt to coordinate the program so that no part will receive too much attention. At present charity patients in this state have ample facilities for medical care. There are about twenty thousand hospital beds in the state, approximately fifteen thousand of which are for non-paying patients, leaving about five thousand for pay patients. Obviously no such ratio should exist. Our efforts should be directed to improvement of facilities for pay patients. There does not seem to be any

need for further expansion of charity facilities; certainly no need for subsidizing beds in various private instiutions other than for very definite emergency purposes.

We should consider the idea of having the State Society make its own survey of hospital facilities in the state to ascertain how the various institutions are being conducted and to formulate and sponsor a definite long-range program.

I can not close this report without expressing my very deep appreciation to Dr. Talbot and his assistants, who have so ably carried on the duties of the office. They have always given us every assistance possible and are doing a splendid job for the State Medical Society. We all owe them a debt of thanks for their unceasing efforts.

RECOMMENDATIONS

1. Study of committees.

2. Continued active support of Louisiana Physicians Service, Hospital Service Association of New Orleans and Louisiana Hospital Service.

3. Active support of AMA by payment of twenty-five dollar assessment; also support of its program.

4. More active interest in rural health problems.

5. Survey of facilities and personnel for medical care in the state by State Society with the idea of formulating a definite long-range program.

M. D. HARGROVE, M. D., President

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LOUISIANA STATE MEDICAL SOCIETY NEWS

CALENDAR

PARISH AND DISTRICT MEDICAL SOCIETY MEETINGS

Society	Date	Place
East Baton Rouge	Second Wednesday of every month	Baton Rouge
Morehouse	Second Tuesday of every month	Bastrop
Natchitoches	Second Tuesday of every month	
Orleans	Second Monday of every month	New Orleans
Ouachita	First Thursday of every month	Monroe
Rapides	First Monday of every month	Alexandria
Sabine	First Wednesday of every month	
Second District	Third Thursday of every month	
Shreveport	First Tuesday of every month	Shreveport
Vernon	First Thursday of every month	

"GRASS ROOTS" CONFERENCE

The Fifth National Conference of County Medical Society Officers (Grass Roots Conference) will be held in Atlantic City, Sunday, June 5. This is the day prior to the opening of the House of Delegates, and arrangements have been made so that this Conference will in no way conflict with the Conference of Presidents. The sessions of the Grass Roots Conference will be held in the morning and the evening, and the Conference of Presidents will meet during the afternoon.

The morning session will be devoted to specific county or parish medical society problems, with three panel discussions on:

I. The problem of emergency calls;

II. Indigent medical care plans;

III. The National Education Campaign.

The last hour of the morning session will be given over to questions on the National Education Campaign, with Mr. Whitaker and Miss Baxter present to provide the answers. Special invitations have been issued to the "Committee of 53" to attend this part of the Conference.

The evening session will be open to all physicians and their wives and will feature talks by Mr. Clem Whitaker, Director of the National Education Campaign, and The Honorable John L. McClellan, U. S. Senator from Arkansas.

DISCUSSION OF COMPULSORY HEALTH PLANS AND CONFERENCE OF PRESIDENTS AND STATE OFFICERS

Discussion of compulsory health plans, for medical care and for disability compensation, will highlight the Fifth Annual meeting of the Conference of Presidents and Other Officers of State Medical Associations to be held at Atlantic City on Sunday afternoon, June 5. The meeting will be held in

the Rose Room of the Traymore Hotel, the day preceding the opening of the AMA general sessions, and it will be open to all physicians.

Cecil Palmer, English publisher, author, and journalist, will tell of the impact of socialized medicine on the British doctor and his patients. Palmer, now completing a tour of America, has been a brilliant spokesman for the British Society for Individual Freedom. An American viewpoint of the British health system will be given by W. Alan Richardson, editor of *Medical Economics*, now in England for a first hand study of all phases of the program.

With compulsory disability compensation programs operating in three states, and Washington and New York the latest to pass such laws, the Conference presents two speakers on this vital question. Edward H. O'Connor, managing director of the Insurance Economics Society of America, will discuss the legislation, and Dr. Bert S. Thomas, medical director of the California program, will tell of the medical implications of cash sickness compensation acts.

The AMA relationship to the state societies will be reviewed by Dr. George F. Lull, secretary of the AMA, and the problems facing the state association at the crossroads will be the subject of a talk by Dr. Clarence Northcutt, president of the Oklahoma State Medical Association. Plans are also pending for the presentation of views on national health legislation by a member of Congress.

ST. MARY PARISH MEDICAL SOCIETY

A meeting of the St. Mary Parish Medical Society was held on March 24, 1949. Dr. Eugene Countiss of New Orleans was the speaker and discussed medical gynecological subjects.

FOURTH DISTRICT MEDICAL SOCIETY

The meeting of the Fourth District Medical Society was held on March 1, 1949, Dr. W. C. Gray of Springhill, President, presiding. A hundred and twenty physicians were present.

A symposium on obstetrics was held. The guest speaker of the evening was Dr. Curtis J. Lund, Professor of Obstetrics at the Louisiana State University College of Medicine. Dr. Lund discussed the "Recent Advances in Neonatal and Fetal Asphyxia."

A brief discussion of the attempts of the Federal Government to socialize medicine was held. The inherent dangers to individual freedoms and to all free enterprise in this country if this bill passes, were pointed out.

EAST BATON ROUGE PARISH MEDICAL SOCIETY

To the Members of the East Baton Rouge Parish Medical Society

Whereas, Dr. C. A. Weiss has been retired from the active practice of medicine for many years due to ill health and can no longer participate in the affairs of the Society; and

Whereas, Dr. C. A. Weiss during his many years of activity in this Society gave freely of his time and efforts in furthering the cause of organized medicine; and

Whereas, during his active association in this Society he was a past president thereof, and a past president of the Louisiana State Medical Society and was a delegate to the State Society for many years; and

Whereas, thru his own initiative, perseverance, hard work, and foresight, he was instrumental in establishing the Indigent Physicians' Fund, now, therefore be it

RESOLVED, that the East Baton Rouge Parish Medical Society by unanimous vote does hereby confer on Dr. C. A. Weiss the title of Honorary Member and be it further resolved that all dues paid by Dr. C. A. Weiss since his retirement be refunded in full; and be it further.

RESOLVED, that in due honor and respect of Dr. C. A. Weiss the annual March meeting of the East Baton Rouge Parish Medical Society, shall hereafter be called the Weiss Indigent Physicians' Meeting at which time a voluntary collection shall be taken from the membership for this purpose and transmitted to Dr. C. A. Weiss during his lifetime to be forwarded by him to the State Society, and thereafter directly to the State fund designated for this purpose; and be it further

RESOLVED, that a copy of this resolution be sent to the State Society and to Dr. C. A. Weiss.

A RESOLUTION

Whereas, Dr. J. E. Blum, a member in good standing of the East Baton Rouge Parish Medical Society, has by self-sacrifice, persistence and practically single-handedly, with demonstrated medical competence and efficiency, made the Greenwell Springs Tubercular Hospital one of the best tubercular hospitals in the State and South, and

Whereas, during a period of eight years, these results were accomplished primarily through the personal efforts of the doctor and furnished a service to the unfortunate victims of this dreaded disease;

Therefore, be it RESOLVED that the East Baton Rouge Parish Medical Society does hereby extend Dr. J. E. Blum an absolute vote of confidence in his professional ability and competence. Be it further RESOLVED that a copy of this

resolution be sent to the local papers, the governor, and the Louisiana State Medical Society.

QUESTIONNAIRE ON SCHOOL HEALTH SERVICES IN EACH COMMUNITY

The secretary of each local medical society will soon receive in the mail a questionnaire on school health services in his community. The American Medical Association in cooperation with the U. S. Office of Education is making a study of school health services through its Bureau of Health Education. The survey is a preliminary step in efforts designed to bring about improvement of school health programs within the framework of the private practice of medicine. For this reason, it is most important that each local medical society complete and return the questionnaire.

The U. S. Office of Education in Washington will concurrently query the schools. Two different questionniares which supplement and reinforce each other and contain no duplicate questions are being used. The information requested is needed to determine present strengths and weaknesses in school health services, to indicate needs, and to point up action for the future. The questionnaire has been tested prior to printing and all unnecessary questions eliminated.

SUPPORT OF THE PRINCIPLE OF PRIVATE ENTERPRISE BY LAY ORGANIZATIONS

The educational campaign to acquaint the public with the danger of state medicine and the effort to focus the pressure of public opinion on Congress needs the approval by lay organizations. Lists of such organizations that have gone on record as opposing the Compulsory Health Insurance Bill have been prepared at the AMA headquarters in Chicago. In the State of Louisiana the following have gone on record as against such legislation:

State Federation of Women's Club

State Medical Society

Calcasieu Parish Medical Society

Rotary Board of Alexandria

Alexandria Lions Club

Alexandria Chamber of Commerce

Breaux Bridge Lions Club

Cosmopolitan Club

Alexandria Kiwanis Club

Pineville Chamber of Commerce

Gonzales Lions Club

Wisner Garden Club

Wisner Lions Club

The progress of the Compulsory Health Bill is being slowed down by such representations. It is desirable for lay organizations in each community to formally place themselves on record as opposed to such compulsion and to forward the resolution to this effect to the headquarters in Chicago.

COMING MEDICAL MEETING

The International Post-Graduate Medical Assembly of Southwest Texas will hold their annual meeting January 24-26, 1950, in San Antonio, Texas at the Municipal Auditorium. Dr. C. F. Lehman is President and Dr. John J. Hinchey is Secretary-Treasurer of the Assembly.

OSWALD ALFONSA EADDY

1891-1949

The Shreveport Medical Society has reported the death of Dr. Oswald Alfonsa Eaddy of Keithville, La. Dr. Eaddy was a graduate of the Atlanta Medical College, Class of 1914. He was an active member of his Parish and State Society since 1919.

CLIFFORD PHILIP RUTLEDGE

1885-1949

Dr. Clifford Philip Rutledge of Shreveport, La. was reported deceased by the Shreveport Medical Society. Dr. Rutledge was associated with the Highland Clinic in Shreveport. He was a member of the State and Parish Societies since 1915. Dr. Rutledge received his medical degree from the University of Alabama and was in practice since 1913.

ALBION BARNARD CROSS

Dr. Albion Barnard Cross of Crowley, La., died on April 22, 1949. Dr. Cross was a member of the Acadia Parish Medical Society and held membership in the State Society since 1915. He studied medicine at the Tulane Medical School and was a graduate of its Class of 1906.

WOMAN'S AUXILIARY TO THE AMERICAN MEDICAL ASSOCIATION

The Twenty-Sixth Annual Meeting of the Woman's Auxiliary to the American Medical Association will be held at Atlantic City, New Jersey, June 6-10, 1949. Headquarters will be at Hotel Haddon Hall.

The meeting will take place simultaneously with the convention of the American Medical Association and invitation is extended to all members of the Woman's Auxiliary to the American Medical Association, their guests and guests of physicians attending the convention to participate in all social functions. There will be four days of general session of the meeting which will conclude with a

reception and ball in honor of the President of the American Medical Association.

Full program of the meeting may be secured from Mrs. James H. Mason, Chairman, Committee on Arrangements, Woman's Auxiliary to the AMA, 535 North Dearborn Street, Chicago 10, Ill.

ASSOCIATION OF GYNECOLOGISTS AND OBSTETRICIANS OF MEXICO

The First Congress of Obstetrics and Gynecology of Mexico will be held on the 22nd through the 28th of May, 1949. This Congress has been organized, primarily by the Association of Gynecologists and Obstetricians of Mexico and its affiliated societies, and will be held in the Justo Sierra Auditorium and the Hotel del Prado in Mexico City.

The scientific sessions will be divided into five groups, one concerning itself with Aspects of Surgical Gynecology; the second with Medical Gynecology and Endocrinology; the third with Infertility and Sterility; the fourth with Obstetrics and the fifth, Laboratory Investigations, Radiology, and Physiology.

The program includes invited guest speakers from Argentina, Brazil, Cuba, Colombia, Chile, France, Panama, Peru, Uruguay, Venezuela, Spain and the United States, as well as members of the Mexican profession. The guests from the United States include Dr. Richard TeLinde, of Johns Hopkins, in the Section on Surgical Gynecology, Dr. Arthur Hertig of Harvard, in the Section on Laboratory Investigation, Dr. M. E. Davis of Northwestern University in the Section on Obstetrics, Dr. B. Bernard Weinstein, Tulane University in the Section on Sterility and Infertility and Dr. E. C. Hamblen, Duke University in the Section on Medical Gynecology and Endocrinology.

The Congress is open for registration to interested physicians throughout the world. The secretaries of the Congress are Dr. Carlos D. Guerrero and Dr. Alphonso Bravo, Marsella #11, Mexico City, D. F., of whom inquiries can be made.

BOOK REVIEWS

Abdominal Operations: By Rodney Maingot, F. R. C. S. Eng., New York, Appleton-Century-Crofts, Inc., 1948, 2nd Ed. pp. 1274. Price $16.00.

"Abdominal operations" has been completely revised, rewritten, and brought up to date. Originally printed in two volumes, the second edition appears in one volume. This does not represent a condensation of material, however, for although obsolete data has been deleted, in its place appears most of the important work that has been done since the first edition was published. Many new chapters have been added on subjects of current interest, some of which were written by world authorities including Dr. Lester Dragstedt, Dr. Stuart Harrison, and others. Current controversial points are presented as such and all sides of each problem are briefly reviewed with enough detail to give the reader a good working knowledge of the problem.

Many new illustrations have been added and the index is much more detailed than in the first edition.

It would be difficult to find any other publication with such a complete coverage of abdominal diseases and their management presented in so few pages.

G. L. JORDAN, M. D.

Human Biochemistry: By Israel S. Kleiner, Ph. D., 2d ed., St. Louis, C. V. Mosby Co., 1948. Pp. 649, pl., illus. Price, $7.00.

The second edition follows closely the pattern of the first edition. It has the same purpose, namely, to provide a simple text which is neither too basic nor too clinical. In the words of the author, "The present volume is an attempt to bring home to the student . . . clinical aspects of biochemistry without usurping any clinicians domain and without neglecting the fundamentals." The author has sought also to bring the student's attention " to some of the more important research work" in a manner which is "neither too elementary nor too advanced."

It appears to this reviewer that the author has been reasonably successful in attaining these objectives in most of the twenty-five chapters. Noteworthy in this respect are the chapters on vitamins, foods, energy metabolism, and hormones. Some excellent colored photographs of lesions associated with B-complex deficiencies in man are reproduced with great fidelity. Also are included several good black and white photographs of vitamin deficiencies in man and animals. Photomicrographs of stained tissue sections are included in several chapters. The several photographs of patients with endocrine disturbances are new and impressive.

Although in general the chapter on blood is not noteworthy, the illustrations (Figure 18) of the absorption spectra of hemoglobin and its most important derivatives deserve notice. Many textbooks of biochemistry have been quite negligent

or even inaccurate in illustrating blood pigment spectra.

One valuable feature of the book is the chapter on changes in the chemical composition of the blood. In this chapter are brought together most of the practical aspects of blood chemistry which in many textbooks of biochemistry are badly scattered. Although the inclusion of such a chapter of necessity involves some repetition, it is excusable on the grounds that it provides a correlation of a number of otherwise isolated facts.

Of considerable interest to the student of medicine is the concluding chapter entitled "Recent Clinical Applications". Under this heading are considered kidney function tests, the kidneys and blood pressure, dental caries, inflammation, tumors, acid phosphatase and the prostate gland, antibiotics, chemotherapy, mucolytic enzymes, and pyrogens. Most of these subjects have not hitherto been given so prominent a place in elementary textbooks on biochemistry.

WILLIAM B. WENDEL, PH. D.

British Surgical Practice: Edited by Sir Ernest Rock Carling, F. R. C. S., F. R. C. P., and J. Paterson, M. S., F. R. C. S., St. Louis, C. V. Mosby Co., 1948. Volume 3, Caesarean Section to Eyelids. Pp. 524. Price, $15.00.

Volume 3 of British Surgical Practice is a further addition to a comprehensive alphabetic encyclopedia of general surgery and the surgical specialties and covers from "Caesarean Section" to "Eyelids". The typography of the edition is exceptionally good. The numerous illustrations are excellent, and the material is presented in an orderly, lucid manner. Bibliographies are brief, and in many instances are omitted in the current volume, but are designed to appear later in the index volume. The range of material covered is so great that brief presentations are the rule. Controversy is avoided and difficult problems often seem to be over simplified. Points of view, on the whole, are sound and conservative. There is a tendency to omit the more recent developments in surgery. This comprehensive and readable compendium of surgical knowledge and practice should prove to be a valuable and handy general reference work.

VERA MOREL

The Biological Standardization of the Vitamins: By Katharine H. Coward, D. Sc., 2d ed., Baltimore, The Williams & Wilkins Co., 1947. Pp. 224, illus. Price, $5.00.

This book should be most useful to anyone interested in the use of biological methods in nutritional studies. The first chapter gives an excellent and concise presentation of the general principles which govern biological assay procedures and should be essential reading for the novice in the field. The main portion of the book is devoted to detailed discussion of methods for the determinations of vitamin A, thiamine, ascorbic acid, vitamin D and vitamin E. In each instance precise instruction is given as to the planning of experiments, reference standards, selection of animals, diets, and evaluation of findings. Suggestions concerning the housing and care of animals are included. When several methods are available for measuring a given vitamin, they are compared and evaluated.

The importance of statistical treatment of findings is emphasized throughout the book while the last four chapters deal more fully with statistical methods as applied to bio-assay technics.

The author, who has drawn largely from her own extensive experience, gives many practical details in outlining experiments. Such information is most valuable but seldom available in publications dealing with methodology. References to recent literature are few. However, the author aimed to stress basic principles underlying biological determination of vitamins and included only technics highly recommended to anyone planning investigations which involve biological methods.

GRACE A. GOLDSMITH, M. D.

An Introduction to Gastro-Enterology: By Walter C. Alvarez, M. D., 4th ed., New York, Paul B. Hoeber, Inc., 1948. Pp. 903, illus. Price, $12.50.

This is the fourth edition of the book which Alvarez first published in 1922 as, "The Mechanics of the Digestive Tract". Like its predecessors, this release will undoubtedly be popular because the author has collected into one readable volume much that would otherwise be found only by consulting many diverse sources. Despite the many changes

that have been wrought by successively revising in accordance with the evolution of gastro-enterology, the gradient theory is still the point of departure of all discussions.

In the opening sentence of the first chapter, Dr. Alvarez reminds the reader that the organ of digestion is the small bowel and that most of the symptoms of indigestion appear to arise in disturbances in the motor function of the digestive tract. Each chapter of the book is something of an individual essay in which these central facts are amplified.

The author, throughout the book, attempts to explain how data accumulated by innumerable research workers may be of service in explaining clinical problems in diagnosis and treatment. This blending is attained with a considerable degree of philosophic observation.

The present edition ought to be of great help to clinicians. While unquestionably many of the statements may be contested, the book is stimulating. It should be read by any student of the digestive tract.

SYDNEY JACOBS, M. D.

Diabetic Manual for the Doctor and Patient: By Elliott P. Joslin, M. D., Sc. D., 8th ed., Philadelphia, Lea & Febiger, 1948. Pp. 260, illus. Price, $2.50.

This current edition of a classic contains a wealth of information for the patient who would understand the diabetes for which he is being treated. As in all previous editions, close attention to the fundamentals of control of diabetes is constantly urged. The conventional expositions of the normal diet, the diet for the diabetic, diabetes as a clinical entity, the complications to be prevented, the method of administering insulin, and bodily hygiene are well presented. Food charts are presented as formerly.

The message of hopefulness is preached again and again. A profusion of illustrations forcibly brings home the point that the properly treated diabetic lives a long and useful life. In a literary style that any patient will understand and enjoy, Dr. Joslin teaches his lessons effectively.

The physician who insists that the newly diagnosed diabetic read this little manual will save himself much time in explaining the details of therapy. The physician who reads the manual for himself will learn considerably of the practical methods of helping the diabetic solve his problems of daily living.

SIDNEY JACOBS, M. D.

Shock and Allied Forms of Failure of the Circulation: By H. A. Davis, M. D., C. M., F. A. C. S., New York, Grune & Stratton, 1949. Pp. 595, illus. Price, $12.00.

In this 595 page book the author assembles much of the experimental and clinical data as well as the theories which have been presented throughout the ages on the various phases of shock and allied forms of circulatory failure. Throughout the volume the author injects observations and thoughts based on his studies and personal investigations. In addition to shock states which occur as the result of trauma, burns, surgical and obstetrical operations, and anesthesia, consideration is given to circulatory failure associated with various diseases, toxemias, and infections.

From the standpoint of its value for purposes of quick references, the conclusions and practical data contained in the book are somewhat obscured in the great array of references. There are extensive bibliographies following each chapter evidencing the tremendous amount of effort which has gone into the preparation of this volume.

AMBROSE H. STORCK, M. D.

Cancer of the Esophagus and Gastric Cardia: Edited by George T. Pack, B. S., M. D., St. Louis, The C. V. Mosby Company, 1949. Pp. 192, illus. Price, $5.00.

This monograph is a compendium of the articles which were published last year in "Surgery" in the form of a symposium on cancer of the esophagus and gastric cardia. All of the contributors are authorities on the various phases of diagnosis and treatment of cancer occurring in the regions indicated by the title of the book. The great strides which have been made in extending operability, and the surgical attempts which are being made to improve the cure rate in cancers of the esophagus and gastric cardia are presented in concise and

readily accessible form.

There is a combined subject and author index.

AMBROSE H. STORCK, M. D.

PUBLICATIONS RECEIVED

Charles C. Thomas, Springfield, Ill.: Fundamentals of Pulmonary Tuberculosis and its Complications, sponsored by The American College of Chest Physicians, edited by Edward W. Hayes, M. D.

University of Kansas Press, Lawrence, Kansas: The Uses of Penicillin and Streptomycin, by Chester Scott Keefer, M. D.